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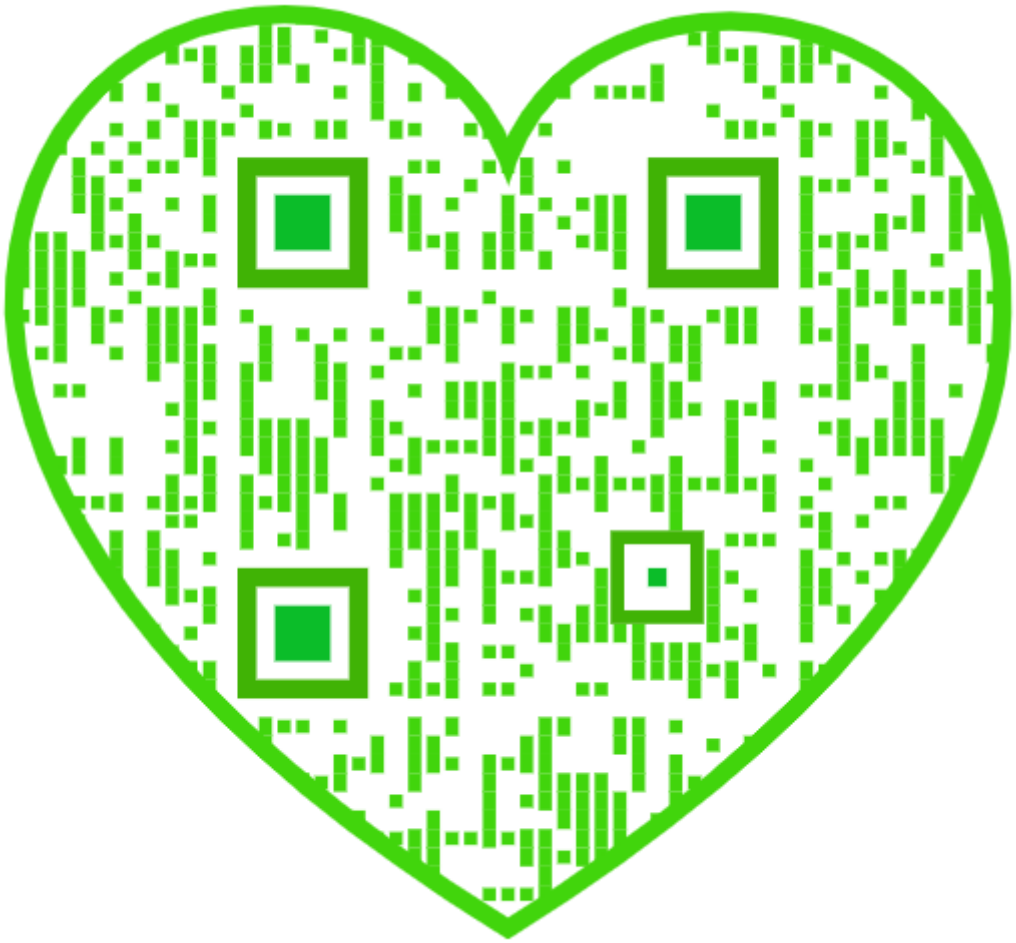
HE TEXTILE WORLD RECORD
KINK BOOKS

# Hosiery and Knit Goods
# Bleaching, Dyeing
# Finishing

LORD & NAGLE COMPANY
Publishers
Boston, Mass., U. S. A.



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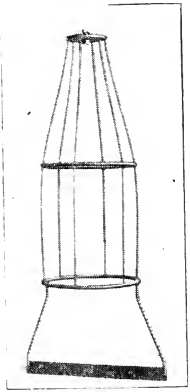

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THE TEXTILE WORLD RECORD
KINK BOOKS

# Hosiery and Knit Goods Dyeing, Bleaching Finishing

Compiled from the
QUESTIONS AND ANSWERS DEPARTMENT
of the
TEXTILE WORLD RECORD
by
CLARENCE HUTTON

PRICE 75 CENTS

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# PREFACE

The success which attended the publication of Kinks for Knitters, Kinks for Knitters No. 2, and Kinks on Cost Finding in Knitting Mills has led us to add this book on Hosiery and Knit Goods Bleaching, Dyeing and Finishing to the TEXTILE WORLD RECORD Kink Book Series. It is composed of practical experiences in many mills.

The editors of the TEXTILE WORLD RECORD are at all times face to face with the problem of securing practical information. For years its subscribers have been invited to make free use of its columns in asking questions relating to textile manufacturing, and it occurred to us that if some of the most important and most interesting of the practical questions that have been answered were gathered together in a handy form for quick reference it would meet a widespread want.

This book contains information which has been supplied by manufacturers, superintendents and overseers from their private record books and their stores of knowledge gained by experience. Many questions are answered and much information given, but subscribers should remember that if there is any informa-

tion they desire which is not given in this volume, it is their privilege to ask the Questions and Answers Department of the TEXTILE WORLD RECORD and every effort will be made to publish the information they want, provided the question is one of general interest to the trade.

No effort has been made to group the questions and answers relating to similar operations in any part of the book. The index has been carefully prepared, however, and its use should enable anyone to secure the information he seeks in the shortest possible time.

Grateful acknowledgment is due to the men who have supplied the information, and if Kinks on Hosiery and Knit Goods Bleaching, Dyeing and Finishing should benefit any of the large number of men for whom it is intended, both they and the publishers will feel that its mission has been accomplished.

TEXTILE WORLD RECORD,
Lord & Nagle Company,
Publishers.

# HOSIERY AND KNIT GOODS DYEING, BLEACHING FINISHING.

## Removing Kier Stains

I am enclosing a small piece of knit fabric that is soiled with kier stains. Can you give us any information regarding a good kier stain remover? We cannot use anything with silicate in it as we have already tried that and found it would not do. Dexter (2153).

"Dexter" is having the same trouble that a lot of other bleachers are having. It is not serious, however, as the stains can be easily removed, as will be seen by the sample returned with the stain removed from it. I feel sure that if any stain remover, or other so-called composition is put in the kier, the trouble will be increased. The only way to remove the stains is to try and locate them in the wet state and have them washed out. If the material is cut up and stains appear, have them washed out just the same.

The following solution is a good stain remover and will not affect the goods in any way. It will remove oil as well as kier stains.

It can be made in larger quantities in the following proportions:

2 ozs. castile soap.
½ oz. saltpeter.
2 qts. soft water.
4 ozs. aqua ammonia.

Dissolve the soap and the saltpeter in the water and when thoroughly dissolved place in an airtight vessel or bottle and add the ammonia. Shake well and let stand for 12 hours, when it is ready for use. Keep the bottle tightly corked to keep in the ammonia. Wash the stain with this solution, rub the fabric slightly and the stains immediately disappear.

The stain in the sample sent does not appear to be a kier stain, as it can be washed out so easily, but appears to be more in the nature of a dirty water stain, which may have been caused when flushing the kier or in the cooling off process. This could be easily determined by a little watching. The fact that it is removed so easily bears out my contention that it is caused by dirty water, for as a rule kier stains are very difficult to remove from a fabric of any kind. Alpha.

## Cross-Dyeing Plated Hosiery

We are making plated hosiery, that is, worsted plated upon cotton. We color our cotton yarn black with sulphur black dye and

dry it at a temperature of about 200°. This cotton yarn colored and dried as above we use with worsted yarn, part of which is all worsted and part about 50 per cent. of cotton and 50 per cent. worsted, but how the cotton in this yarn is colored we do not know. We color these goods with an aniline dye, using formic acid. We dry these goods in a temperature of about 200°. We have been led to think that possibly in the coloring we might tender the yarn or goods and we wish to do something at once to have this remedied so that the yarn when colored will be just as strong, or nearly as strong as when in the white, and that our goods when colored and dried will be as strong as before coloring. We wish to ascertain if you know anything in regard to the workings of sulphur black, also the workings of aniline in connection with formic acid, and if the temperature would have anything to do with developing the acid or oxydization which might weaken the yarn or goods. Adam (1916).

From the above question it appears that this manufacturer uses two kinds of yarn in combination with the cotton yarn which he dyes in his own dye house with a sulphur black. One of these yarns is all worsted and the other is composed in part of cotton and in part of worsted, the cotton of this thread having been dyed by a process unknown to the correspondent. In cross-dyeing his material, he uses an "aniline dye" together with formic acid, and wishes to know what influence formic acid has on the sulphur bleach

and the aniline, and whether there is likely to be a tendering of the cotton.

Formic acid has no destructive action upon wool or cotton in the dye bath, its action being, in the case of ordinary acid colors, that of an assistant, causing a gradual taking up of the color by the wool from the dye bath. It is seldom used in cotton dyeing. Properly dyed sulphur blacks are not acted upon by any ordinary mineral or vegetable acids, so that no fear need be entertained as to tendering of the goods after dyeing if reasonable washing is given. As a precaution after dyeing sulphur colors, a few ounces of sodium acetate for 100 gallons of final rinse water may be given. This will remove all tendency of the sulphur bleach dyed material to become tender. Beta Napthol.

## Soap for Knit Goods

I am sending you two swatches of knit cloth. One is about 60 per cent. wool and wool stock, the rest cotton, and the other is all cotton. I am using a soap made of 50 pounds good palm oil soap, 75 pounds alkali, 180 gallons water, and am using 12 gallons to 90 to 100 pounds of the goods. The goods are all right when they are first finished, but after being boxed and lying four or six weeks they smell oily. Waveland (1908).

The following is a good formula for making soap: Have two tanks, one for palm oil soap

and one for olive oil soap or green soap. The tanks should hold about 90 gallons of water. Fill half full and add 60 pounds of palm oil soap to one tank, and in the other add 60 pounds olive oil soap. Boil both solutions until they are well dissolved and then run up the tanks full of water, adding 30 pounds ammoniated potash, and boil for two hours, when the soap is ready to use.

To treat 80 pounds of goods, first use 6 gallons of palm oil soap, or 2 pailfuls of olive oil soap. It will be easy to get at the cost. One hundred pounds of goods is too much for any fulling mill to attempt to full at one time. I have always had good results and there is no odor from the goods. Howard.

---

## Quantity of Bleaching Powder Required

In looking over a technical paper I find it stated that the amount of bleaching powder required for 1,000 pounds of knit goods is 50 pounds. This is far below what we have been able to get a good bleach with and I wish you would advise us what amount of bleaching powder should be used for bleaching 1,000 pounds of goods. We make up our bleaching powder with equal parts of soda ash and chloride of lime and run the goods twice through the solution at 1 1/2°, using sulphuric acid to sour with. Dexter (2024).

Theoretically 50 pounds of bleaching powder might be sufficient to bleach 1,000 pounds of

knit goods, but in practice more would be required. When scientists experiment to determine what would be required to produce a certain result, everything is brought down to a fine point, every grain of chlorine would be extracted from the bleaching powder, and the sediment would be washed and rewashed until every particle is extracted. On the other hand, the material used in the test would not contain any surplus water to neutralize off the action of the chlorine and reduce its bleaching power.

There are a great many bleacheries handling knit goods, piece goods and raw stock, in which the chlorine is not thoroughly extracted, because it is not allowed time to settle and be washed off thoroughly. In these bleacheries the water is not extracted thoroughly, in many places the squeezing does not get them dry enough, thus reducing the strength of the chlorine. If under-boiled more chlorine is required to get a white, and it is only a poor white at that. It is a well known fact that oxycellulose will be produced in 4 1/2 to 5 hours with chlorine at 4° Tw. and left for this length of time. "Dexter" may not know that mixing the chemic powder with soda ash, thus producing the sodium hypochlorite, which is the bleaching agent then, will necessitate a longer time in the bath

to produce a good white with less risk of tendering the goods.

If it were possible to get the goods right in the boil, all the dirty water washed out and the goods fairly dry without carrying any surplus water in the chlorine bath, then 50 pounds of bleaching powder would be sufficient for 1,000 pounds of goods, providing, of course, care was used in mixing the bleaching powder and all the chlorine extracted. It takes too long to wash off the powder to the last pinch when it is a question of production. Time is too valuable to be washing a sediment to extract a few grains of chlorine.

When a bleachery is being built it costs but little extra to duplicate or even triplicate a mixing tank with lower tanks for settling purposes. I have always claimed that it takes too much chlorine to bleach the cotton at the present time. Dulcimer.

---

## Dyeing Black on Cotton and Wool Knit Goods

Kindly give the methods followed in dyeing black on cotton knit goods and on cotton and wool mixed goods. What classes of dyestuffs are employed and which is the best.

Groman (3363).

The following article by J. M. Matthews, published in a recent issue of the Textile World Record, answers this question fully:

For the dyeing of black on knit goods a number of different classes of dyestuffs may be employed, depending on the quality of the color desired, as well as its special properties of fastness, and the cost. The cheapest method of dyeing cotton knit goods is to employ the substantive or direct cotton colors. A large number of these are marketed by different manufacturers, and almost any desired tone of black may be obtained. The direct cotton colors are applied in a very simple manner, using a solution of the dyestuff in a bath containing a considerable amount of common salt or glauber's salt; very often a small quantity of soda ash is added for the purpose of better exhausting the color from the dye bath.

The following method will yield a good black on cotton knit goods by the use of a direct cotton dyestuff:

For 100 lbs. of goods:

6 lbs. Patent Dianil Black F F conc. (Farbwerke).
35 lbs. common salt.
1 lb. soda ash.

The cloth should first be well scoured by boiling in a bath containing 2 lbs. of soda ash and 1 lb. of Monopol oil. This will serve to wet the goods out so that the dyestuff may be readily and evenly taken from the dye bath.

The use of the oil will also tend to preserve the softness of the fiber and prevent the cloth from acquiring a harsh feel.

After scouring and squeezing to remove the excess of liquor, the goods are run into the dye bath, the temperature of which should be about 140° F. to start with. After running for about 15 minutes so that the material may become thoroughly saturated with the dye-liquor, the temperature is raised to the boiling point and the dyeing continued for about one hour. The goods are then rinsed off, hydro-extracted and dried.

To obtain a finer tone to the color, this black after dyeing and rinsing may be topped off in a fresh bath containing:

1½ ozs. Methylene Blue B B conc. (Farbwerke).
3 lbs. olive oil soap.

The second bath should be used at a lukewarm temperature, and the goods should run in it for 20 minutes, then rinsed off, hydro-extracted and dried. A large number of other direct cotton blacks may be employed in the same general manner, and the special one selected will depend to a great extent on circumstances, such as the exact tone of color desired and the cost at which the color is offered.

Knit goods are generally dyed in the roll

er piece. Several rolls are tied together, forming a long chain, the number of rolls to the chain being dependent on the weight of the fabric. A wooden dyeing machine, Figs. 1 and 2, is employed, consisting of a tub provided with a revolving winch on top. The chains of cloth are passed over the winch and circulated

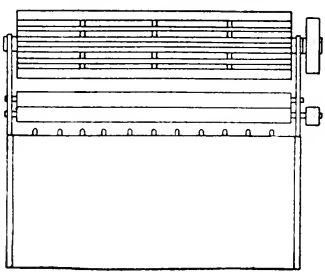

FIG. I

through the dye liquor in the tub below. Usually from eight to twelve chains are run in one machine side by side. As the goods come up from the liquor they are passed through a set of small squeeze rolls and then run on the revolving winch. The squeeze rolls and winch should be so set and run at such relative speeds that there is as little tension on the cloth as possible, as the tension while the cloth is running in the dyeing operation tends to stretch the goods out of shape and also materially reduce their elasticity.

The machine employed for the previous wetting-out or scouring of the cloth is similar in every respect to that employed for dyeing. Unless a number of successive lots are to be dyed, the goods may be rinsed off or topped off in the machine used for dyeing, simply

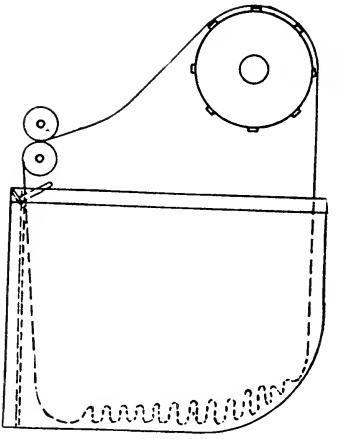

FIG. 2

running off the dye liquor and refilling with fresh water.

The black obtained by the use of the direct colors, though cheap and easily applied, is not very fast either to washing or perspiration. It is these two qualities of fastness which are most desirable in the case of knit goods, as

this character of fabric is made into garments which are to be worn next to the skin and which must undergo continual laundering. Black knit goods, however, for underwear are only used for special purposes, such as theatrical tights, etc., and sometimes cheapness of color may be more desirable than fastness.

To obtain a good fast black on knit goods either of two methods is available: (a) dyeing with developed dyestuff; or (b) dyeing with a sulphur black.

The following example will suffice to illustrate the method of dyeing with a developed dyestuff:

For 100 lbs. of goods:
- 6 lbs. Diamine Black B H. (Cassella Color Co.)
- 2 lbs. soda ash.
- 20 lbs. glauber's salts, calcined.

The goods are entered in the dye bath at about 160° F., and run for 15 minutes, then the temperature is raised to the boiling point and the dyeing continued for 30 minutes. The steam is then shut off and the bath allowed to cool down for about 20 minutes. This method allows of a better absorption of the dyestuff than if the bath were kept at the boiling temperature throughout the entire dyeing operation.

The goods are now rinsed off slightly in

order to remove the superfluous dyestuff solution mechanically adhering to the surface of the fibers. They are then entered into a fresh bath known as the diazotizing solution. This bath is prepared in the following manner:

5 lbs. sodium nitrite.
5 lbs. sulphuric acid conc.

The nitrite is first dissolved in water and added to the bath, then the sulphuric acid is slowly run in and the liquor well stirred up. This bath is employed cold and the goods are run in it for about 20 minutes.

The goods are then rinsed off and immediately passed into a third bath known as the developing solution, which is made up in the following manner:

1 lb. phenylene diamine.
4 ozs. soda ash.

They are dissolved together in some boiling water and then added to the cold dye bath. The goods are run in this solution for 20 minutes, then rinsed off in a lukewarm and dilute soap solution for the purpose of brightening and softening the fiber. The black has a very good depth and tone, and is very fast to washing and perspiration. This class of blacks is largely employed for knit goods. The cost of dyeing, especially on account of the number of

baths, is considerably more than for the direct blacks.

The sulphur dyes form a very desirable class of colors for the dyeing of knit goods, as they are rather cheap, are easily applied in one bath and yield colors that have excellent fastness to both washing and perspiration. The fastness to washing, in fact, is better than for the developed colors. The following example illustrates the method of applying the sulphur dyes to knit goods:

For 100 lbs. of goods:

10 lbs. Sulphur Black A extra.
(Berlin Aniline Co.)
10 lbs. sodium sulphide (calcined).
5 lbs. soda ash.
50 lbs. common salt.

The goods are entered in the bath at 160° F., and the bath is then gradually brought up to the boiling point and maintained there for 45 minutes or one hour. The goods are then well rinsed off, or better yet, washed in a luke-warm bath containing a little soap and a small amount of olive oil in emulsion. This is for the purpose of softening and brightening the cotton and also of giving a more lustrous and better tone to the color.

The proportions given above for the preparation of the dye bath are for the first bath. If the solution is to be employed as a standing

bath these amounts may be very considerably decreased for the second and third baths.

For the dyeing of black on knit goods containing a mixture of wool and cotton it is necessary to employ dyestuffs which are capable of dyeing on both fibers alike or to employ two separate baths, the one for the purpose of dyeing the cotton and the second for the dyeing of the wool.

For a one-bath black on such knit goods the following may be recommended:

For 100 lbs. of goods:

8 lbs. Azo Half Wool Black T L extra. (Metz & Co.)

25 lbs. glauber's salt.

The dyeing is started at a temperature of 140° F., and gradually brought up to the boiling point and the dyeing then continued for about an hour. This will give a black having a fine tone of color and of good fastness.

J. M. Matthews.

. . .

As a Developed Black for dyeing hosiery Zambesi Black V (Berlin Aniline Co.) is well known to the hosiery trade on account of its beautiful bloomy shade. It is used both on cotton as well as on silk goods with excellent results.

For 100 lbs. of hosiery use

8 to 10 lbs. Zambesi Black V

to start with and

25 to 30 lbs. common salt.

In the standing kettle 25 to 30 per cent. less dyestuff is required and only 5 to 10 lbs. of common salt.

The goods can be entered at the boil. Boil gently for one hour and rinse in two cold waters.

Then diazotize for 20 minutes in a cold bath containing

3 lbs. Nitrite of Soda and

12 lbs. Muriatic acid.*

[*In case of copper or brass dye vessels use about half the amount of Sulphuric Acid in place of the Muriatic Acid.]

Rinse in two cold waters and develop immediately for 20 minutes in a cold bath containing

1 lb. Meta Toluylene Diamine and

1 lb. Soda Ash.

Rinse in one cold water and soften as usual.

Mercerized goods require about 25 per cent. less dyestuff than mentioned above; on silk goods it takes sometimes a little more.

Of Sulphur Blacks, the brand Sulphur Black F A G Extra Strong is one of the most popular. Although it does not yield as fine a shade as the one obtained with Zambesi Black V, it is a good substitute for Aniline Black. It is recommended principally for ordinary

cotton goods. For mercerized goods Zambesi Black V is more advisable.

For 100 lbs. of goods use in the

1st kettle

10 lbs. Soda Ash.
20 lbs. Sulphide Soda Concentrated.
10 lbs. Sulphur Black F A G Extra Strong.
50 to 60 lbs. common salt.

2nd kettle

5 lbs. Soda Ash.
12 lbs. Sulphide Soda Concentrated.
8 lbs. Sulphur Black F A G Extra Strong.
20 to 25 lbs. common salt.

3rd kettle

2 lbs. Soda Ash.
9 lbs. Sulphide Soda Concentrated.
7 lbs. Sulphur Black F A G Extra Strong.
10 lbs. common salt.

4th and standing kettle

2 lbs. Soda Ash.
8 lbs. Sulphide Soda Concentrated.
6 lbs. Sulphur Black F A G Extra Strong.
5 lbs. common salt, if needed.

Enter the goods at the boil, boil gently for 3/4 hour and run 15 minutes without steam. Then wash in at least three cold waters and

soften in fourth one at a temperature of about 125° Fahr. for 15 minutes.

In order to know the strength of the standing kettle the usual method is to twaddle the dye liquor after all the chemicals, except the salt, have been added and boiled up thoroughly. Take some of the liquor in a pail or some other suitable receptacle and allow it to cool down to 195° Fahr. Read the twaddlemeter at this temperature only. If the liquor shows a density of 3° Twaddle or over, no salt is required for the standing kettle; if it is less than 3°, add from 5 to 7 1/2 lbs. common salt.

Sulphur Black is not suitable for silk goods.

## Preparing Bleaching Liquor

What is the best way to prepare bleaching liquor for the bleach vat? We want the most modern and up-to-date method. Sometimes we have yarns that are somewhat red in color and in going through the boiling and bleaching process we find this color will not bleach out white. Please give us a recipe for a boiling compound to use with a regular caustic soda boil that will remove this yellow color.

Clifton (2070).

The best method of preparing bleaching liquor is by using the electrolyzer. The liquor is free from sediment and can be regulated to produce a uniform strength of bleaching liquor. Another very good method of prepar-

ing bleaching liquor is to mix the chemic powder with soda ash, thus producing sodium hypochlorite, which gives a better white than the ordinary bleaching liquor, and allowing the goods to remain in the chemic bath a little longer with less risk of tendering.

From the information "Clifton" gives I feel sure that the trouble is not caused by the method of preparing the bleaching liquor. The trouble is caused either by the goods not being bleached long enough or by making the liquor too strong. It is not necessary to use any bleaching compound, soap, or bleaching assistant in a caustic boil as this has a tendency to aggravate the trouble. On one occasion I had to bleach a lot of cotton similar to that which "Clifton" refers to. I bleached it, took it back and rebleached it, but all to no purpose. I drew this to the attention of the cotton sampler, who was an expert on cotton, and he informed me that the cotton had grown on swampy, marshy ground and was called "black" cotton. When this cotton is held up to the light it gives the reddish tint "Clifton" complains of. The same result will follow if the chemic is used too strong, especially in a caustic bleach, as this has a tendency to force the bleach.

The cause of the difficulty might be traced to the kier. If the liquor drawn from the kier

is very dirty and discolored "Clifton" should make a second weak mixture of soda ash and boil again for three or four hours, noting the second liquor that is drawn off. This method requires less chemic than does one boil and produces a better white without adding either soap, resin or bleaching assistant. A compound will not work as well in a caustic boil as in a lime boil. If the following method is carried out good results should follow. In the first liquor use a 1 to 2 per cent. solution of caustic soda according to quality of goods to be bleached. Boil five to six hours. Flush the kier for half an hour and mix a 1 to 1 1/2 per cent. solution of soda ash and boil for another three to four hours. Draw off the liquor and wash well using a chemic solution of not higher than 1° Tw. Let the goods age for three to five hours and sour off with an acid solution of 1 1/2° Tw. When the goods have aged for a couple of hours to neutralize the chemic, wash off and finish. If the chemic is mixed with soda ash I feel sure that a better and more lasting white which will not turn yellow with age will be the result. Alpha.

---

## Water for Bleaching Cotton Knit Goods

We are enclosing an analysis of water. Would this water be suitable for bleaching cotton knit goods? If not, how could it be treated to make it so.

| Contains: | Grains per Gallon. |
|---|---|
| Silica | 1.9244 |
| Iron and Alumina | .1633 |
| Sodium Chloride (Salt) | .2216 |
| Sodium Sulphate | .6123 |
| Potassium Sulphate | .3966 |
| Calcium Carbonate (Carbonate of Lime) | 2.2978 |
| Magnesium Carbonate | .4082 |
| Total Solids by Evaporation | 6.1350 |

Matthew (1926).

In bleaching cotton knit goods it is advisable to use as pure a water as possible. The reason for this is not only to effect an economy in the use of the chemicals employed for the actual bleaching and boiling out processes, but also with an idea of obtaining a better quality of bleached fabric. The softer and cleaner the water used, the softer and cleaner will be the resulting cloth after bleaching.

From the analysis of the water as given in the inquiry, I would say it would be classified as a moderately soft water, but from the fact that it contains quite an appreciable quantity of iron, it is liable to give trouble in boiling out and bleaching. If the iron were removed and the water also properly softened, it would be very good to use in bleaching. While it could be used untreated and perhaps quite satisfactory results obtained, if the knit goods

are bleached on the open run, nevertheless, I would recommend that the water be filtered.

Before the prospective manufacturer decides definitely on this matter it would be best for him to take the advice of a suitable consulting chemist experienced in the matter of bleaching cotton goods. Howell.

. . .

A sample of water shows upon analysis to contain

| | Grains per Gallon. |
|---|---|
| Silica | 1.9244 |
| Iron and Alumina | .1633 |
| Sodium Chloride | .2216 |
| Sodium Sulphate | .6123 |
| Potassium Sulphate | .3966 |
| Calcium Carbonate | 2.2978 |
| Magnesium Carbonate | .4082 |
| Total solids by evaporation | 6.1350 |

This water is not unsuited for hosiery bleaching provided the quantity of iron present does not materially increase. The figure (.1633) given in the analysis is for both "iron and alumina," with the presumption in favor of the alumina predominating, in which case no serious results will be had. The analysis shows that the "hardness" of the water is about 3 1/2°, which is comparatively low, and which could hardly be improved to advantage.

The iron can be practically removed by aerating the water, that is, arranging a sort of fountain or spray so that the water in fine particles come in contact with the air which then oxidizes the iron to the insoluble ferric state, when it is removed by sand or other form of filtration.

A simple means exists for purifying water by the quick adding of chemicals. The commonest water purifying system is based upon the use of caustic soda and milk of lime, both in very small quantities calculated upon a number of analyses, and which cause a most complete removal of dissolved impurities, including iron, which is the most objectionable impurity from the bleacher's point of view.

Beta Naphthol.

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## Bleaching Silk Hose

Please give us a recipe for bleaching silk hose. Elcot (2199).

Silk hosiery is bleached with either peroxide of sodium or peroxide of hydrogen. The hydrogen peroxide is much easier to handle, although a little more expensive than the other. A cement tub having lead steam pipes is necessary. Boil the hosiery first with 8 per cent. Turkey red oil and 8 per cent. silicate of soda for 2 hours. It is also advisable to use 10 per cent. of a neutral olive oil soap.

Rinse twice in warm water after boiling and enter in a boiling bleach prepared as follows. For 100 lbs. hosiery:

Add to boiling liquor
15 gals. 10 vol. Hydrogen Peroxide,
2 qts. Silicate of Soda, alkaline reaction.

The silicate must be previously dissolved in boiling water. Stir the bath thoroughly, enter goods and let stand for 2 to 4 hours. If cotton toes and heels are present they will bleach more slowly than the silk fiber. When the desired whiteness is obtained rinse twice in cold water and blue if necessary. The peroxide bath should be as concentrated as possible. Seminole.

## Bleachery for Ladies' and Children's Underwear

Can any of your bleachers tell me why yellow marks appear in bleaching and finishing our ladies' and children's underwear.
P. W. Co. (3226).

Some years ago I was working in a lace mill as bleacher and finisher when a manufacturer of knit goods came along and asked me for some information regarding bleaching underwear, as he intended to install a bleaching plant in connection with his mill. I told him all I could, gave him the information, and in about six months' time I was taken

into their employ. They were then having a number of complaints about yellow places in the goods and the difficulty was so serious that they discharged their dyer. They had a bleachery large enough to take care of two mills. There were six tanks in a line, each 6 feet by 4 feet by 4 feet; two large iron tanks for mixing chloride of lime; a large laundry washing machine and a hydro-extractor.

When I looked into the first tank I found that the former dyer had been using it for a boiling kier. He had the steam pipe below the false bottom. I found a piece of cast iron pipe to use as a vomit pipe. I did not like the idea of boiling from the bottom. While the vomit pipe was being fixed I looked over the other tanks and found that No. 2 tank had been used for washing off; No. 3, as a bleaching tank; No. 4, for washing off; No. 5, for souring, and No. 6, for washing off.

I saw right away that the goods need not be handled all the way down the line of tanks, so I got No. 1 tank ready and the dyer threw the rolls in, one on top of another. It seems that this was the way the work had been done previously, so I began to see right away what had caused the yellow marks. I put a piece of pipe through the center of the roll and hung the pipe up by its two ends. I then took the end of the goods and walked out

with it about 12 yards, laid the goods back and forth and fastened them up with rags one yard apart.

When the goods were all tied up I weighed them. To 100 lbs. of goods I used 1 lb. caustic soda and 1/2 lb. soda ash. I boiled the goods four hours, run them off, then put on water and steam together and brought them to a boil; run off and this time made them cool enough to handle.

Then I put the goods into No. 2 tank, which I had filled with a chloride of lime solution at 2° Tw. I let them stay in this solution about 45 minutes, when I put some planking over one-half the tank and lifted the goods on it to drain the chloride of lime liquor back into the tank. The goods were next washed in cold water, and soured in the washer by running for 15 minutes in a solution of sulphuric acid at 1/2° Tw., and rinsing. Next came a run in a light suds of olive oil soap and bluing. Run off and put in an extractor.

While one batch was running in the washer another batch was being boiled. The first batch was hung up to dry and the next morning the goods were a good color and soft to the feel. When the goods were taken from No. 3 tank the next morning the manager wanted to know where the other three tanks came in. I told him we had no use for them.

He said it had cost him thousands of dollars for bad work and extra machines.

One day the manager came along with some union suits he wanted scoured. They were a mixture of wool and cotton. I found out what length he wanted when finished and put them in the washing machine, wet them out and then put in some good soap. I ran them in this solution ten minutes and then stopped and measured a few of them. When the length was right I took a note of the time required and it was an easy matter to finish up the rest. Hector.

## Finishing Merino Hosiery

Under another cover we are sending you a sample of our 108-needle merino **half** hose. This is made out of yarns that will run 100 grains to 50 yards, about equal to a No. 4 cotton, in the heel, toe and leg. We have always had a lot of trouble in finishing these goods, or goods of this character, so that they would come out smooth at the points where the heels and toes are looped on. There seems to be for some reason too much yarn in the heels and toes, causing them at this point to pucker up, or rather to buckle up, giving them the appearance of being poorly finished. We have tried to overcome this in every way, but even if these goods are put on boards and pressed it does not take up the excess yarn at these points, but simply folds it over and wrinkles it.

We also have some difficulty in getting the heels and toes even at the points where the

two looper seams end, which should be exactly opposite each other near the center of the heel and toe. There is a tendency for the heels and toes to appear lop-sided after they are finished. There will appear to be more of the white heel and toe showing on one side of the sock than there is on the other, no matter how carefully they are boarded. There is a dispute between our knitting and finishing departments as to whose fault this is, each claiming that the other is to blame. It looks to us as though the difficulty was mechanical, as no board that we can fit these socks to will produce a smooth heel and toe, without buckling up or causing bad folds or wrinkles in them. Wilcox (1964).

One may suggest forty remedies to right the trouble and yet may locate the difficulty at the first suggestion. Examining the sample, I find it is twisted from leg to toe, which is the reason for the points not meeting together as they should. I would suggest "softening" the yarn, which will add much to the appearance of the sock, giving better face and finish. This should have a tendency to eradicate the twist and keep it straight. Failing in this, have the spinner give an opposite twist on the yarn, as the material cannot but come out as it does where the twist is same as run of machine. The "softening" should do much and the cost of doing this is hardly worth taking into consideration. Most certainly the yarn should not be knit dry.

For softening the yarn fix a small trough on the winder (where the yarn passes through shippers) and have a metal drum revolving therein. The mixture of softening is 5 pounds good quality soap, 1 quart lard oil to about 30 gallons of water. Have yarn pass over the drum. If only a little softening is desired have drum revolve with yarn, or revolve to the right; if wanted or necessary to be well softened have drum revolve against the yarn.

Kentland.

## Boiling Off Silk Knit Goods

I expect to be called upon to knit silk with the gum in it and would like to know the best formula for removing the gum after knitting. Can you give me some information on this subject. Knitter (2013).

The first requirement is soft water and the second good soap containing no free alkali and a large percentage of perfectly saponified fat. White curd soap, guaranteed neutral, is principally used for discharging silk gum in England and the most careful users find that it pays handsomely to buy the very best in the market. It pays waste-silk spinners, for example, to buy a make of soap costing 25 per cent. more than the best quality that second-rank soap boilers can produce. The cheaper soap gives them approximately as good a luster and handle as the best soap, but

the effect of the alkali shows itself in the subsequent loss in the form of waste. Free alkali weakens and destroys silk fibers, causes them to be brittle and to break and leads to a large production of fly-waste. The fact is mentioned to emphasize the desirability of using the best quality. There are other reasons than those of strength because a dark soap will be prejudicial to the color and an inferior soap, although it may produce a good white to begin with, may lead goods treated with it to turn brown later under the action of sunlight.

It is advisable to use a soap containing about 64 per cent. of fat and 11 per cent. of alkalies and the strength of the solution to employ depends somewhat on the class of silk used. Probably 10 to 15 pounds of soap for 100 pounds of goods will be sufficient with one to two hours' heating at 180° F. The goods will lose about 25 per cent. in weight. They can be "scrooped," if need be, by treating them finally in a weak solution of acetic acid.

James Strand.

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## Amount of Steam for Heating Water

What amount of steam is necessary at 100 pounds' pressure, to raise water at 60° F., in a wooden tub (capacity 10,000 pounds) to a temperature of 210° and keep it at this temperature for one hour? The temperature of

the room is 60° F. The water surface exposed to the air is 38 1/2 square feet.

Yorke (1998).

"Yorke" states that the steam is under 100 pounds pressure. At this pressure it will have a temperature of 338° F. and one pound of steam under such conditions will contain 1,189 heat units. Since the quantity of water to be heated is 10,000 pounds and the initial temperature is 60° F., with a final temperature of 210° F., this would mean that the necessary heat units required would be: $10,000 \times (210 - 60) = 1,500,000$ heat units. Since the water surface exposed to the air is 38 1/2 square feet and the temperature of the room is 60° F., the heat lost by radiation from this surface will be as follows:

Under normal conditions the heat lost from 1 square foot of water surface during one hour, when the difference in temperature between the water and the surrounding air is 1° F., is equivalent to 1.0853 heat units. Consequently under the above conditions we have the total heat lost to be $1.0853 \times 38.5 \times 150 = 6,267$ heat units. This loss must be added to the quantity of heat required to raise the temperature of the water in the first place from 60 to 210, giving a total of 1,506,267. If this total quantity of heat units is now divided by 1,189, which factor is the total heat in a pound of steam, the result, 1,267 pounds,

is the quantity of steam at 100 pounds pressure required.

This figure does not take into consideration certain corrections which are necessary where extreme accuracy is required, but which lead to rather involved mathematical equations if considered, and for practical purposes the effect will not be to change the amount very largely. For example, the radiation of the heat takes place not only during the hour that the water is maintained at a temperature of 210°, but it has been constantly going on during the time the water is being heated and the amount of radiation has been gradually increasing with the temperature of the water. Again, the factor 1.0853 which is given in text books as the quantity of heat radiated from one square foot of water in one hour when the difference in temperature between the water and the surrounding air is 1°, is a factor which is only approximately true when the water is at a comparatively low temperature, that is, much below its boiling point; but when the water is raised to 210° F. it is just under the boiling point, and the amount of heat radiated will be proportionately greater, as there will also be a considerable quantity of steam coming from the water.

A further correction would have to be made in a very accurate calculation to account for

the heat used up in the evaporation of the water, especially when it is approaching its highest temperature.

Furthermore, another correction enters into the calculation to allow for the water added to the tub by the condensation of the steam used in heating it. All of these calculations involve the highest form of mathematics to deduce theoretically and since the conditions in practice are so varying, it would be impossible to solve a theoretically accurate mathematical equation to account for all these factors unless a certain set of standard conditions be adopted; such as, for instance, the rate of flow of the steam into the water, the rate of evaporation of the water from the surface depending not only on its increase in temperature, but also on the question of air currents passing over the surface and also on the moisture and temperature of the air with which the water comes in contact. For practical purposes, however, the approximate figure which we have given will be sufficient.

J. M. Matthews.

## Bleaching Goods Made from Ramie Yarn

Can you give me a suggestion as to how to bleach the darker of the two enclosed samples a pure white? I want a method of treating the tubings to get them white. The enclosed samples are made from ramie yarn, the

darker piece being domestic and the clear white made from imported ramie yarn.

Lenox (1917).

The tinctorial properties of ramie are similar to those of cotton. The cheapest way of bleaching ramie is with chloride of lime. The material is first boiled off either in an open tub or a closed kier. The more care given to this operation the better will be the results of the bleaching process. It is indispensable to add to the boiling bath 3 to 6 per cent. of calcined soda or 1 to 3 per cent. of caustic soda at 38° to 40° B. A small quantity of rosin soap is sometimes added and the ramie is boiled for 5 to 8 hours. The boiling-off is sometimes done with soda and milk of lime, which corresponds theoretically to boiling with caustic soda, but at a somewhat lower price.

After boiling off the material is rinsed and then immersed in a bath of chloride of lime 1/2° to 1° B. It is better to prepare a fresh bath every day. After leaving the ramie in the bath for 6 to 10 hours, it is removed, rinsed and soured with dilute hydrochloride or sulphuric acid. The material is then rinsed thoroughly, passed through a hot soap solution and blued with Outremer blue.

When a pure white is desired the material is subjected to this process a second time. At the second treatment the bleaching bath is

either made weaker or the material is left in a bath of normal strength for a shorter time. The large bleacheries use special kiers in which the material is subjected to the boiling-off, bleaching, souring, rinsing and soaping operations without being removed, thus reducing the cost of labor. In the small bleacheries the material is boiled in open tubs made either of copper or wood. The bleaching, souring and other operations are carried on in wooden tubs containing about 100 pounds of material. The proportion of material to liquor is about 1 pound to 20 pounds by weight. Care should be taken to avoid having any solid pieces of chloride of lime in the bath, which should be perfectly clear and not too strong. The material should be stirred constantly. If these precautions are not taken there is danger of tendering the fiber.

In some establishments the solutions are left standing for some time before being used in order to get a perfectly clear liquor. Care should also be taken to keep the ramie submerged in the liquor, otherwise contact with air will result in its becoming tender.

Gaul.

. . .

Goods of this material are usually bleached with sodium hypochlorite, although some bleachers prefer to use the ordinary solution of bleaching powder which is diluted to stand

at 1 1/4° to 1 1/2° Tw. The most satisfactory method is to use the sodium hypochlorite solution prepared as described below. The actual bleaching may be done in wooden tanks of sufficient capacity to hold several hundred pounds of goods, or the bleaching may be done in an open tank over which is mounted a slowly revolving winch worked by hand or by a chain. This gives the bleach boss entire control of the operation.

Ramie should be bleached cold, and after the process has advanced sufficiently for the grade of white desired, the material should be thoroughly rinsed with clean water, afterwards with one water containing a very small quantity of muriatic acid, followed by a thorough rinse with clean water. If bleaching is effected with bleaching powder solution instead of sodium hypochlorite, the use of muriatic acid is all the more necessary on account of the harsh feel generally imparted to the goods when oil of vitriol is used.

Sodium hypochlorite is prepared by the bleacher in the following manner: Dissolve separately 100 pounds of 33 per cent. bleaching powder in 40 gallons of water, and 60 pounds of soda ash in 20 gallons of boiling water, afterwards diluting with 10 gallons of cold water. The soda solution is then mixed with the bleaching powder paste, well stirred for one-half hour and allowed to settle over

night. In the morning the clean solution is drawn off and the residue washed with several changes of clean water, the wash waters being added to the main solution to bring it up to 150 gallons standing at 6° to 7° Tw. Now add 1 1/2 to 2 pounds of soda ash, allow to dissolve and let stand over night, when all the lime will be thrown out of solution. It is then ready for use by simple dilution in water.

Care should be exercised in bleaching ramie not to allow it to remain in the bleach solutions longer than necessary to produce the degree of bleach desired, and further, to use as weak a bleach liquor as possible. Slow bleaching is always more thorough than rapid bleaching. Good washing after bleaching is equally as important as the proper strength of the bleach solutions. Berwick.

. . .

Knit goods of ramie yarn may be bleached in the piece by the following method: The goods are first scoured or boiled out in a solution containing 2 per cent. of soap and 1 per cent. of Turkey red oil, the cloth being run for one hour in this solution at a boiling temperature. The best way to handle the goods would be in a string-tub machine, where the goods are operated on in the form of a long string which is carried through the scouring bath, up through squeeze rolls, and

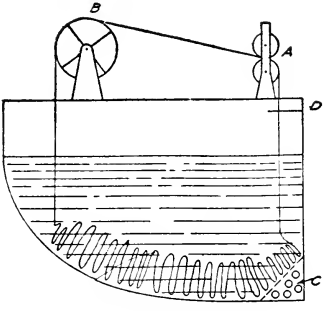
then over a large reel or winch, from which the goods fall back into the bath again (see figure). From eight to twelve strings of cloth may be run at once, each string being kept in place by passing through a pot eye or pin bar as it comes up from the liquor and before it reaches the equeeze rolls.

After receiving a thorough scouring the goods are rinsed with warm water until all the soapy liquor has been removed. They may then be bleached by a number of processes.

(1) For a bleach which will yield a very soft fabric and retain the full strength and durability of the fiber, it is recommended to use the peroxide method. A bath should be prepared containing 10 gallons of hydrogen peroxide solution (of 10 volume strength) with 20 gallons of water and one pound of sodium silicate. A machine similar to the scouring vat may be used for bleaching, only no metal parts must be allowed to come in contact with the solution, and the steam pipes for heating must be made of lead. The goods are started in this bath cold, and the solution is gradually heated up to 180° F. After the goods have run for one hour, the strings are untied, taken from the reel, and completely immersed beneath the liquor, and allowed to stay overnight. They are then removed to the scouring machine where they

are finally given a rinse with warm water, and the bleaching is finished.

(2) For a cheaper bleach the chloride of lime method may be used. The goods are first boiled out in the manner already described. They are washed free from soapy liquors and then bleached by running in a cold solution of




CROSS SECTION OF SCOURING VAT.

a) Squeeze rolls. (b) Reel. (c) Coil of steam pipes beneath a perforated wooden partition. (d) Pin bar or pot eye.

chloride of lime (chemic) standing at 1 3/4° Tw. It will require about one hours' treatment in this bath. Then the cloth is well washed in cold water, and next given a treatment with 5 per cent. (on the weight of the goods) of anti-chlor (sodium bisulphite solution of 36° Tw.) for 20 minutes cold. Finally a thorough washing with cold water is given. To give a soft finish to the goods a further

treatment may be given with a dilute soap bath at about 160° F., and if a bluish-white bleach is desired a little bluing may be added to the soap bath. Howell.

## Temperature for Drying

What is the best temperature for drying hosiery previous to boarding? We want the goods left in the best condition to secure a finish. We make 176 and 200-needle carded mule spun and mercerized goods.

Craigie (1905).

A low temperature of 70° or 80° F. is best. Spread the stockings in an open box drier on wire screen shelves and force all the air possible through them from a large fan at the bottom of the drier. Stir the goods up occasionally to prevent their drying out in spots. This also tends to prevent marks where they are creased or folded. This is an excellent method, because it allows the boarders to get out a good production on a moderate heat.

To obtain the best results do not let the hosiery lie around wet after it comes from the hydro-extractor. Winwick.

## Non-Shrinkable Process for Knit Goods

We are having some trouble with the color of our worsted goods which we put through a non-shrinkable bath. The fabric we are treating is what is known as a sanitary mix and

contains a percentage of brown wool. What we would like to get is a good non-shriknable process. Possibly you know of some method of bringing the clear white color back again after the treatment has yellowed it. We are forwarding sample swatches of the cloth before and after this process. The difficulty seems to be that the fabric turns yellow after going through the non-shrinkage bath. The fabric we are sending you is 50 per cent. worsted and 50 per cent. cotton, the worsted being on the face. The process which we use for treating the goods is muriatic acid and bleaching powder. Gerrard (2041).

There is but one process for rendering knit goods non-shrinkable, and it has suffered very slight modifications at the hands of different workmen The only practical way of rendering knit goods or wool fiber in any other form non-shrinkable, is to treat it with chlorine under certain conditions. It is immaterial whether the goods contain cotton or not. Although the cotton is not injured by the process, the fabric after having been treated should not be allowed to dry out until thoroughly washed. Lead lined tanks may be used for the process, but they are not a necessity.

The goods to be treated are scoured and rinsed free from all grease, and are made up into batches of sufficient size for proper handling. A solution is made by adding 7 1/2 gallons of commercial muriatic acid (about

73 pounds) of 35 per cent. strength, to 500 gallons of cold water. The material is then immersed in this bath for 15 minutes or until thoroughly saturated, then lifted and allowed to drain well, and, without rinsing, immediately immersed in a solution of 20 per cent. of bleaching powder, calculated upon the weight of the goods. The goods are kept in this solution for 1/2 hour during which time they are given several turns, then lifted and reentered into the muriatic acid bath, where they are kept for 20 minutes additional. Following this they are rinsed thoroughly and treated for 15 minutes in a bath heated to 100° F., and containing 50 pounds of bisulphite of soda per 500 gallons of water, then lifted and finally rinsed. This bisulphite bath is employed for the purpose of removing the last traces of hypochlorous acid from the goods, and also to correct the objectionable yellow tone which white wool takes on when treated with chlorine.

The bleaching powder bath above mentioned is prepared in the following way: fine, dry chloride of lime containing 35 per cent. of available chlorine, as determined by assay, is stirred to a uniform paste in a large stone crock, or other suitable vessel, with five times its weight of cold water. When all lumps have disappeared, fifteen times the weight of

water is poured on the paste and the whole stirred and allowed to settle, after which the clear liquid is drawn off for use. It will be found convenient in carrying out this process to have suitable testing apparatus and chemicals at hand for determining the strength of the chlorine liquor, as but little reliance can be placed on Twaddle glasses for chlorine strength. Hardly two solutions of bleaching powder made at different times and showing the same degree on the glass will have the same content of chlorine, and it is the chlorine only that is of use in making the wool non-shrinkable.

In connection with the foregoing, it may be of interest to note that a scroopy or silk-like feel on goods treated as above can be obtained by passing the goods for 10 minutes through a bath containing 5 pounds of olive oil soap per 100 gallons of water, then souring off lightly in dilute muriatic acid; then whiz and dry.

A soft handle to the goods is given by passing the chlorine-treated material through a bath made with

¾ to 1 lb. Olive Oil Soap
1½ to 3 ozs. Olive Oil
1 oz. Ammonia (20% strength)

per 12½ gallons of water.

The goods are soaked in this bath for 15

minutes, whizzed and dried. The bath is not heated. It should be further noted that wool that has been chlored or made non-shrinkable has a much greater affinity for dyes than wool not so treated. L. J. Matos.

## Methods of Bleaching Hosiery

What is the method most commonly employed in bleaching hosiery? Which is the cheapest, the lime, peroxide or electric process. Bradford (1971).

For the bleaching of cotton hosiery of the ordinary grades the most common and notably the cheapest method is to use bleach liquors prepared from chloride of lime. The hosiery should first be boiled out with alkali in a suitable kier, or if such is not available, it may be boiled in a washing machine for 2 to 4 hours with 2 per cent. of caustic soda and 2 per cent. of soda ash, calculated on the weight of the goods. The material is then thoroughly washed and is treated with a chloride of lime solution of 1 1/2° Tw. This treatment is carried out in the cold and should be for a period of about 1 to 1 1/2 hours. The goods should be kept immersed beneath the liquor during this time.

Then a thorough washing should be given with plenty of fresh water, and the excess of chlorine compounds may then be removed by

treatment with a bath of anti chlor (sodium bisulphite) using about 5 per cent. of the sodium bisulphite liquor (36° Be.) on the weight of the goods. This bath is used cold and for about one-half hour. A very thorough washing is then given the material for the purpose of removing all the chemicals and the bleaching is finished.

Should it be desired to give the color a bluish tint, a final finishing bath may be given in which a small amount of bleacher's tint may be employed together with 1 to 3 per cent. of cotton softener. This bath is maintained at a lukewarm temperature (120° to 140° F.) for one-half hour and the goods are then taken out and extracted without further washing.

A softer bleaching can be obtained by using a solution of hypochlorite in place of the chloride of lime liquor. Sodium hypochlorite can be obtained in ready-made form as a solution in carboys. In this form it is quite expensive compared with chloride of lime. It can be made, however, by the bleacher himself very readily from a solution of soda ash and liquid chlorine. The latter is now available on the market at a cheap price and forms a very convenient and easy method of preparing bleaching solutions of sodium hypochlorite.

Sodium hypochlorite may also be prepared by the electrolysis of a solution of common salt. This requires the installation of an electrolyzing outfit and if electric energy is available at a cheap rate, the electrolytic method is a very convenient and cleanly method of handling the preparation of bleach liquors.

The method of bleaching with peroxide (either sodium peroxide or hydrogen peroxide solutions) is excellent but more expensive than the method of bleaching with hypochlorites, either of lime or soda. For the ordinary and low grades of cotton hosiery the cost of peroxide bleaching would probably be too great, but where fine grades are being operated on and also where the goods consist of mixtures of cotton and wool, or cotton and silk, then the peroxide bleach may be used with great advantage.

J. Merritt Matthews.

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## Handling Goods in Bleachery

Please advise us as to the sizes of knitting machines for knitting 4, 5, 6, 7, 8, 9 vest and umbrella pants, using a one and one rib and cut to shape. Is there any special way of handling this line of goods from the knitting to the bleachery and then to the cutters? Also advise us as to the amount of strength this garment will have in stretching on the last turner. Knitter (1985).

Regarding the sizes, the correspondent

should first decide on the weight of the garment, size of yarn and gauge of machine, as the weight of the garment can be varied by the gauge and size of yarn. I give here the sizes of machines for No. 25 yarn knit on a machine with cylinder and dial cut 12 needle to the inch: Size 4, 15 inch; Size 5, 16 inch; Size 6, 17 inch; Size 7, 18 inch; Size 8, 19 inch; Size 9, 20 inch. These are the sizes to get a full sized garment, although I believe that the majority of makers would use one size smaller where they sell to jobbers and have to meet a certain price.

The best way to handle this cloth from knitter to bleacher and from bleacher to cutter is in the fold, so as to avoid all stretching and pulling. I believe, however, that the majority of this work is sent to the bleacher in rolls and after bleaching rolled in rolls again over a calender dryer, then the roll is put on a folding machine, the goods laid in folds and left to condition before cutting. Madison.

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## Bleaching Cotton and Silk Mixtures

I would like an explanation as to how mixtures of cotton and silk are bleached.

Oakes (3237).

The bleaching of mixtures of cotton and silk presents special difficulties. Half silk cannot be successfully bleached with chlorine com-

pounds, because of their action on the silk. On the other hand, sulphur compounds cannot be used, as the sulphurous acid retained in the fiber will oxidize to sulphuric acid and tend to carbonize the cotton.

Bleaching with peroxide of sodium is an oxidizing process. The natural coloring matter receives an additional amount of oxygen and forms a white soluble compound, which is removed by subsequently rinsing the goods. If water acidulated with sulphuric acid is neutralized with sodium peroxide, hydrogen peroxide is formed and glauber salts remains in solution. If an alkali is added, the hydrogen peroxide in contact with the fiber will decompose into water and active oxygen, which oxidizes the natural coloring matter to a white soluble compound.

When bleaching half-silk the goods should first be boiled out with a soap free from caustic. A concentrated bleaching solution should be used. If the solution is too weak the bleaching process will be too slow and the silk may as a result be of a yellow or brown shade. The inside of the bleaching vat should be covered with canvas, as the wood, especially near knots, has a tendering action on the cotton. It is necessary to prevent any metal from getting into the bath. Lead or any other metal pipes should be avoided. If the steam is free from

iron the bath may be heated by a rubber hose with direct steam. If lead pipes are used to heat the bath, the liberated oxygen will combine with some of the lead to form lead peroxide, which is readily absorbed by the silk, giving it a yellow shade.

The required quantity of sulphuric acid is added to enough water to cover the goods without crowding. Then sodium peroxide is added under constant stirring until the bath shows a neutral reaction with litmus paper. The bath is then heated to 140° F. Just before the goods are entered the bath is made slightly alkaline, preferably with sodium silicate. As soon as the goods are a good white, they must be taken out of the bath and rinsed several times to remove the glauber salts and the natural coloring matter that has been oxidized. If the goods are left in the bath too long the silk will turn yellow. As bleaching with peroxide of sodium is an oxidizing process, the goods will not turn yellow after a white has been obtained, because the oxidized coloring matter has been removed by the subsequent rinsing. Granicus.

## Uneven Shades in Dyeing Hosiery

The enclosed samples of hosiery have been dyed together in the same batch by the ordinary oxidized aniline black process. You will notice by comparing the two stockings that

one is a bluish black and the other has a brownish tint. This happens quite frequently and I would like to know what causes the trouble and how it can be remedied.

Dyer (1957).

Not knowing the exact process through which these goods were put it is hard for one to give the cause and remedy for the uneven dyeing, but the following may be a few of the causes: To begin with it is necessary that the goods in question be thoroughly wet out or boiled out, and that they are boiled out uniformly before they go to the dollys, or pounders, for the so-called first process. Second, the goods must all be taken out of this liquor and hydro-extracted for from 3 to 5 minutes. Do not let the goods get too dry. Then spread out evenly in the ageing or oxidizing chambers or cages. The heat in these cages should not exceed 95° F., or at the very most 100°. Here let them stay for 4 or 5 hours, according to the depth of the shade required. This is the most important part of the whole process.

Sometimes a few pair or a dozen stockings will be accidentally left over and go through the same process with the next lot, and this may be the cause in the case under consideration. It is a good plan if crowded for time and space to dump the stockings out to age for another hour or two before starting the

goods on the next process. The goods should now be brought to the washers or reverse machines for the chroming process, and this is another place where shades may be varied. Here again the operative may leave a few stockings in the chrome liquor, and consequently these will go through the same process again, making a darker and browner shade on the goods.

After chroming the goods must be thoroughly rinsed. I would suggest that the foreman follow one batch right through each process, and if he finds one batch to come out all right, he should check up the different processes all the way through. I have no doubt but that this difficulty is caused by an uneven wetting of the goods, or else some of the goods being left over from one process to another. This might also be caused by either too little or too much extracting, or uneven heat in the oxidizing cages. By following up each process carefully I never have uneven shades. Edgmoor.

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## Marking Knit Goods to Stand Bleaching

Can you give us any information in regard to marking knit goods that we have to bleach? We have never found a satisfactory method of marking the cloth before it goes into the kier. Salem (1052).

"Salem" can overcome this difficulty by using coal tar diluted with carbolic acid to a consistency of thick cream. This will withstand the bleaching process. It is used with stamps and a pad. The pad is made in the following manner: Get a shallow box the size of the stamp required, put in a layer of thick felt at the bottom, spread over this felt a thin layer of diluted coal tar, then cover with a piece of rag or waste knit goods. It is then ready for use. Press the stamps on the top layer of cloth until the tar comes through on the stamp, then use it on your goods.

The top cloth is to prevent too much tar from getting on the stamp and blurring the marks. Care should be taken to keep the stamps clean, as the flakes from the goods stick to the stamp and thus make the stamping thick and blurred. I have blocks made of different shapes and sizes, with oval, triangle or diamond outlines for different purposes and the letter or figures are made on little blocks of wood which are inserted in the larger block. A thumb screw on the side holds them in place. Dulcimer.

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## Bleached Goods Turning Yellow

I am enclosing two samples of knit goods. Both pieces were bleached with chlorine made from an electrolizer. I boil off for five hours in a Jefferson kier, using 2 per cent. bleaching

assistant, 1 per cent. caustic, 1/4 per cent. Turkey red oil, rinsing in a kier for one hour. I then take the goods out and wash in a machine for one-half hour in hot water, then in cold water, then run them in the chlorine liquor for one hour at 2° Tw. Rinse in cold water for 20 minutes, sour in 5 per cent. antichlorine for 25 minutes, rinsing thoroughly. Blue and take out, extract and dry in a Hurricane dryer at a temperature of 120° F. After the goods lie around for a few days they turn yellow. I also have the same trouble with my heavyweight goods. Duplan (1276).

The electrolizer chlorine bleach is very popular and very good. "Duplan's" trouble may be in the bleaching. Another hour would do no harm. It is best not to use any Turkey red oil, as the oil retards the action of the caustic on the goods. The bleaching assistant, if it is a good one, should serve the purpose that the oil is used for. It seems to me that the chlorine bath is a little strong at 2° Tw., and would tend to force a white on the goods. It would be much better and cheaper if "Duplan" used the chlorine bath a little weaker and let the goods lie a little longer, instead of forcing them, as one hour is not long enough for the chlorine to do its work. If the goods are thoroughly bottomed in the boil for one hour, or the chlorine bath is too short, use the chlorine at 1° Tw. and leave the goods in longer, as 1° is strong enough unless the goods are very heavy.

It seems to me that the antichlorine is not strong enough, otherwise the goods are not long enough in this bath to neutralize the chlorine in the goods. This will produce the trouble "Duplan" is having. The drying at 120° is all right, and the goods should be soft when dried at this temperature.

If "Duplan" will try the following process for one batch of goods I am sure his trouble will disappear:

Boil for 6 hours with

2 per cent. bleaching paste,
1 per cent. caustic soda,
1 per cent. soda ash.

Leave out the oil. Follow the usual process as to washing the goods, using the chlorine at 1° Tw. and let the goods lie a little longer than before, or until they are a good white.

The antichlorine used, whether it be muriatic, acetic or sulphuric acid, should be tested and used about 1/2° Tw. stronger than the chlorine bath, leaving them long enough for the acid to neutralize the chlorine in the goods. Then wash and blue the goods and dry as usual. A lot of trouble in bleaching yarn, knit goods and piece goods is caused by rushing in the process to keep up the production and to keep down the cost, at the same time sacrificing the finish. Alpha.

## Uneven Bleaching

In the caustic boil we have trouble with brown spots which the boil does not seem to strike, the cloth not being bleached evenly.
Chadwick (1019).

These brown spots may be due to several causes. The goods may be packed unevenly in the kier; in fact I think this is the chief cause of uneven bleaching. The goods should be plaited down level and not be allowed to fall in heaps. If the goods are put in the kier in a careless manner, or in lumps, it will be impossible for the liquor to penetrate the goods thoroughly. This will also cause the goods to be blown and tender in places if boiled long enough.

Another cause for this trouble is not having enough liquor in the kier. If the goods are boiled in a high pressure kier, care must be taken not to have too much material in the kier. When the goods are packed level and even and the blocks are being put in for packing, always leave a little space for the goods to swell before putting on the manhole covers. It is also important to have sufficient liquor in the kier. If there is not enough liquor brown spots will be noticed underneath the blocks. If the goods are boiled in the open low pressure kiers, no trouble can arise in bleaching except from uneven packing of the

goods, insufficient liquor, or the goods being underboiled.

If the goods are boiled in the open kier, watch the plaiting of the cloth. Boil each kier the same length of time and see that the goods are well covered with liquor. If the spots still appear, watch another kier in the packing and give the goods one hour longer in the boil. I would not advise the use of stronger caustic until all other means have been tried. Delco.

. . .

"Chadwick" does not state whether he uses any soap or not with the caustic. It might be well to use a little soap and boil the goods at least 12 hours. If the brown spots still show after the bleaching, souring and washing, it would be well to put the goods into a vat and give them a clear boil for one-half hour. Cool them off with two waters, give them a weak bleach and then sour. I do not think the cloth is properly boiled in the first place, and that is the source of all the trouble. Winthrop.

. . .

Uneven bleaching is nearly always caused by the improper treatment in the boiling process. The goods must be clean and free from all foreign materials before entering the kettle. In handling knit goods it is not neces-

sary to give them a very severe treatment. If the caustic is boiled in a separate kettle and the goods are wet out evenly no brown spots will appear. If the cloth is put in the kier dry and cold water run in and the caustic added the goods will come out uneven and spotted.

The goods must first be run through hot water. After the cloth has been plaited down, close up the kier, open up the valves and let the steam blow through for about 15 minutes. This will wet down the goods and press out the air. Then fill up the kier by putting the hose to the waste pipe. See that the water does not get below the surface of the goods while they are boiling.

All knit goods require about 2 1/2 hours boiling at 5 pounds pressure. When the goods have been boiling this length of time, let the pressure down and flush kier before drawing off the liquor. This method will result in even work, if the kier and water is clean. If the boiling is to be done in an open kettle the water should be heated to 140° F. before the goods are put in.

In place of caustic a good alkali will do better work and make the goods softer. Get a good, clean bottom and the work will be satisfactory. Devon.

. . .

The brown spots complained of are no doubt due to uneven penetration of the boil-

ing liquor. To remedy this trouble I would suggest dampening the goods and then boiling in an ordinary wooden kier. Care should be exercised in packing the goods uniformly in the kier. The latter is an important point. If the goods are packed solid in some portions and very light in others the liquor will naturally circulate more freely where the least resistance is offered. To eliminate trouble of this nature it is frequently found necessary to install an iron pressure kier. Palmetto.

## Spots on Knit Goods

I am enclosing a piece of knitted fabric. We are having considerable trouble with black specks which you will notice on the goods. Kindly tell us what is the cause of the difficulty. Claxton (2076).

The spots on the sample of knit goods submitted have the appearance of iron spots, and I find that soap and water will take them out. This indicates that they are not caused by iron from the kier, otherwise soap and water would have no effect on them. They are evidently made by black oil or dirty water. It is difficult to say just what does cause them, as "Claxton" does not say where they are first noticed, whether after the goods are taken from the kier, or after being finished.

I was in charge of a plant a few years ago when spots began to appear on the goods.

Some were small and some large and in some places the spots appeared as if a black liquor had been put on with a fine spray. We watched batch after batch and could not locate the cause of the spots. We finally concentrated all of our attention on the extractor, and finally found the cause by accident. The man who did the oiling was using too much oil, which was squirting out and occasionally flying on the goods.

I had the same trouble in another plant where I worked and we spent a lot of time looking for the cause. Finally it was discovered that a bearing under one of the washers had worn down and was a little loose. When the machine was running it would give a slight jump every little while and the dirty water and oil would squirt on to the goods. Soap and warm water with a little rubbing would remove the spots. Any of the above causes might apply in "Claxton's" case, or the spots may come from some overhead bearing.

The kiers may not be whitewashed enough. Is a wash used to take the scale off the boiler? Is there a return system in the plant that carries the exhaust from the engines and machines back to the boiler, taking along with it all kinds of oil and grease that would pass through the strainers and get into the boilers to be returned with the live steam and

deposited on the goods in the kier? The trouble can be caused in any of these ways. First of all, watch the kier, as no doubt the trouble is caused there. Delco.

. . .

The trouble appears to be caused by oil dropping from the holes in the bed plate to the rollers or plate underneath, spattering or spreading on the rollers, and coming in contact with the cloth there. The spots might come from the gears if they have no high guard. These causes would arise on a machine where the cloth stands still. If the cloth goes around, the cause may be too much oil on the take-up rocker and cams, as it would spatter all the way around, there being nothing to protect the cloth beneath. Examine the hangers above the extractors. Wrap the hangers with rags to soak up the oil and keep the take-up rollers clean. Trenton.

## Softener for Cotton Yarn

We are boiling 2/26s cotton yarn in an open kier for eight hours. After washing, liming and scouring, we soap and blue the yarn and then extract it. What softener should be used to make this yarn feel less harsh, and should it be used in the soaping? Warwick (1020).

Softeners are generally used in the soaping. Any good softener would do the work. Most bleachers use no other softener but a good

soap, or they add to the soda liquor some form of soluble oil, such as monopole soap, Turkey red oil, etc. This helps to cleanse and soften the yarn. The yarn can be made to feel less harsh if carbonate of soda is used instead of caustic soda in the boil, or by using sulphurous acid or bisulphate of soda, instead of sulphuric acid. Wash the yarn well, especially after using the acid. Amazon.

## Shrinkage in Dyeing and Bleaching Cotton and Worsted Yarns

Can you give me some information as to what the actual results have been in loss of weight in dyeing and bleaching cotton and worsted yarns? Should there, if the proper dyeing process is used, be any loss in the weight of cotton? Champlain (2155).

In the ordinary process of bleaching when the yarns are put up in five-pound bundles, it is the custom to allow a surplus of from 8 to 28 per cent. overweight, each per cent. being called a "point". This is the weight I used to allow in our method of bleaching, and this rule was arrived at after years of experience. Of course, the quality of the stock, kind of yarn, color to be dyed, and the amount of handling the goods have to be put through in the process have to be taken into consideration. A short staple yarn will show a greater percentage of loss than a long staple yarn; a

fine twisted yarn will not show the same loss as a coarse yarn. The reason for this is that a fine twisted yarn has more turns to the inch than a coarse yarn, the fiber being held more firmly in place and there is less waste in the process.

The same is true of yarn to be dyed. If the goods are to be dyed a light shade they require more bleaching, thus resulting in more loss than would be the case in a yarn requiring a dark shade. Some of your readers may say, Yes, but what about the weight of the dye that is put in the bath? Very little weight is imparted to the goods from the passage through the dye bath. If the yarns are not handled very carefully in the process a considerable difference will be found between the goods being handled roughly and carefully.

Most modern plants are equipped with apparatus for determining the loss during bleaching, the loss or gain in dyeing, the breaking strength in the grey, and the breaking strength of the yarn after dyeing and bleaching. I was employed in a plant where we had to check each batch that went through, not all the batch, but select at random one bundle and test it. If there was too much variation from the last test of the same kind and quality we would test another bundle to see if the variation was the same. A

few tests that I made were as follows: In some bundles of 2 ply 8s, 12s and 16s we found a loss of from 7 to 15 points (7 to 15 per cent.). Some even lost as much as 23 points. Occasionally we would find a bundle that would be a little heavy. Upon opening it we generally found it to contain too much moisture. When thoroughly dried out it would show the usual percentage of loss.

On the finer qualities tested, made from long staple cotton, 35s to 50s yarns, we did not get the same variation, nor did they show the same amount of loss as the lower qualities. They rarely exceeded a loss of 12 points, varying from 2 to 7 points. I would suggest the weighing of say two bundles in the grey, tag them and after going through the process, examine them to determine the exact percentage of loss. Alpha.

. . .

Cotton generally loses up to 7 per cent. of its weight, but this figure is not to be taken as applying to all cottons, some of which lose more than others. Unbleached cotton seldom loses during dyeing more than 3 or 4 per cent. of its actual weight, but this is offset by a certain quantity of color that is taken up from the dye bath.

Few results are recorded giving the exact figures of losses, and those that are made

public are somewhat unreliable because they do not allow for the normal content of moisture contained in the goods.

Worsted loses only the natural suint that is normal to the wool, and the oils that are added to it during the manufacturing process, and which should be all removed by the scouring. During dyeing wool seldom loses in weight if it has been properly scoured.

Berwick.

. . .

In the dyeing of cotton yarns which have not been bleached the loss in weight will depend considerably on the nature and class of dyestuff employed. In the case of the usual substantive cotton colors there will be a loss in weight of from 1 to 4 per cent. This is explained by the fact that in the boiling-out and wetting-out of the cotton yarn a good deal of the adhering wax and resinous matters on the fiber is removed. In the general run of cotton yarns this, if completely removed, would amount to about 5 per cent. in weight. As a rule, however, in the mere dyeing of raw cotton yarns the removal of these matters is incomplete, and furthermore there is a slight accession of weight due to the amount of dyestuff which is taken up by the fiber, together with some of the salt used in the dye bath. It is seldom, however, that the

loss in weight of dyeing raw cotton amounts to more than 4 per cent.

Naturally it can be understood that a heavy dyed color should cause less loss in weight than a light tint, as the amount of dyestuff taken up is far different. In dyeing a heavy shade, especially black on cotton, the fiber may absorb 2 or 3 per cent. of its weight of dyestuff; whereas in dyeing light shades and delicate tints only one-tenth of the per cent. of dyestuff may be absorbed. This weight of absorbed dyestuff subtracted from the general loss in weight due to the removal of the natural impurities in the fiber by the boiling water will give the actual loss of weight.

In the case of bleached yarns the loss will depend to a considerable extent on the degree of bleaching. In the case of a bleach intended for white goods where a very thorough boiling-out and bleaching operation must be carried out, the loss will be from 5 to 7 per cent. This is frequently cut down somewhat in the case of cotton already bleached by softening the yarn. In such a case the fiber will take up a small amount of softener, which includes various vegetable oils and soaps, and consequently the apparent loss in weight is not as high as if it were bleached without the use of the softener. This, however, is not very large and is seldom more than 1 per cent. of the weight of the cotton.

In the case of cotton cloth the weight of the finished article will depend very largely, of course, on the degree and character of finishing materials and stiffening agents added to the cloth after bleaching. If, however, the pure fiber alone is taken as a basis, the loss of weight in bleaching will be about 5 per cent. It must be borne in mind that calculations on such a basis are seldom feasible in the case of cloth, owing to the fact that in the weaving of the cloth the warp yarns are generally dressed or sized to a considerable degree with starch or other materials so that the weight of the fiber has been changed. In the subsequent boiling-out and bleaching operations these dressing and sizing ingredients are removed from the cloth and consequently the pure unfinished bleached cloth might show a very considerable loss in weight, much more than would be represented by the actual loss due to the removal of the natural impurities on the fiber.

In dyeing cotton yarns with other than the substantive dyestuffs there may be times when instead of a loss in weight there is an actual gain experienced. This is sometimes true of dyeing sulphur blacks or other sulphur colors on cotton where enough of the dyestuff is taken up by the fiber to overbalance the loss caused by the removal of the waxy and resinous matters in the fiber. Under such condi-

tions there may be an increase in weight of the dyed goods to as much as 4 or 5 per cent. Also in the case of basic dyes on cotton there may be an increase in weight where tannin-antimony or tannin-iron mordant is employed in connection with the actual coloring matter. If heavy shades are used there will sometimes be an increase in weight instead of a loss and even under ordinary circumstances where medium or even light shades are employed there will seldom be an actual loss of weight experienced in the dyeing. This is due to the fact that the addition of the tannin and metallic salt, together with the quantity of dyestuff absorbed, is sufficient to counterbalance the loss of the weight due to the removal of the natural impurities on the fiber.

With worsted yarns the loss in weight experienced by dyeing and bleaching will vary widely, depending on the amount of oil and impurities present in the worsted yarn. In the case of Bradford spun worsted yarn there may be a loss experienced in scouring the yarn which will amount to as much as 6 to 10 per cent. This loss represents the oil emulsion which is used for the purpose of lubricating the fibers in the spinning operations, and also includes the miscellaneous dirt and impurities collected by the fiber during its process through the various manufacturing opera-

tions. Some worsted yarns of a high class are very clean and about the only loss experienced in the scouring is that due to the oils which have been added. In the case of French spun worsted yarn there is little or no oil added to facilitate the spinning operation. Consequently the loss in scouring will seldom be more than 2 to 4 per cent.

From these losses in scouring must be deducted the weight added to the yarn in dyeing by the absorption of the various mordants and dyes which may be employed. In the case of acid colors, the amount of absorption of course will naturally depend on the depth of shade desired. Heavy shades may take up as much as 2 to 3 per cent. in weight of dyestuff and this varies down to a very small increase in the case of light shades. Where the yarn is mordanted with chrome or other metallic salts there is a further addition of weight amounting to as much as 1 to 2 per cent. No general rule of loss in weight can be given under these circumstances without knowing the particular conditions of operation, but it may be stated as a general fact that worsted yarns will lose from 2 to 6 per cent. in dyeing. This, of course, including the loss of scouring, which operation must naturally precede the dyeing. J. M. Matthews.

## Weighting Knit Goods in Finishing

I enclose sample of fabric knit on a plain circular knitting machine and bleached by the chloride of lime process. Please give me some information regarding the weighting of the fabric. Is it possible to put in 1/4 or 3/8 to 1/2 pound in these goods per dozen and not have it show in the goods when finished or dust out in the process of manufacture? One firm a few years ago put on the market a solution for weighting underwear, but it was not a success and I would like to get some information whereby I can weight this fabric successfully. Whatever weighting material is put into the goods would have to be a material that would not turn dark or yellow after the goods had stood for a while. Macon (2061).

Our English correspondent replies as follows:

The inquiry does not disclose the percentage of weight that it is desired to add, but inferentially the percentage is low. In that case the possible gain from weighting is little and it is clear that any treatment used must be cheap. Whether the gain is worth the trouble and the risk is for the inquirer to judge.

Presumably such a sizing as would be useful in weaving would be out of place in a knit fabric in which bulkiness is a desirable feature and it would seem to be simplest to add any weighting compound to the garment after bleaching and washing and before drying.

The obvious measure is to use some deliquescent salt to attract and retain moisture in the garment, but the presence of moisture invites the risk of mildew and necessitates the use of some antiseptic to counter that risk. There are objections to the use of most of the mineral salts that could be mentioned. Nearly all of them are irritants of the skin and some are poisonous. Magnesium chloride is named by an eminent chemical firm as the most suitable and it will not be difficult or expensive to make experiments with this. Glycerine is probably too expensive for use.

The antiseptics which might be employed are carbolic acid, salicylic acid or thymol. The first-named has a pungent smell to which objection might be taken and of course all of them add to the expense. It is possible that if experiments were undertaken by sizing chemists that new light would be gained and for this purpose a yard or two of fabric should be sent.

Whether it is to the advantage of the trade to introduce weighted fabrics is a separate question. In some businesses the introduction of artificial loading has been anything but a blessing. Obviously nobody who has found a trustworthy means of loading is going to rest content with saving 4 to 8 ozs. per dozen garments, and excessive loading means trouble more or less for everybody. Weighting has

been a curse to the European silk trade, in which 1 pound of silk comes back from the dyer weighing anything between 2 to 5 pounds. Yorkshire worsted dyers and finishers had to enter into a solemn compact (not too well kept) to refuse to load worsted for anybody.

Woven cottons can be adduced as an instance to the contrary, but in them the loading very often contributes towards the lustrous effect that is desired. Hygenically, it is clear that nothing is to be said in favor of putting mineral salts and water into underwear and knitters will probably regret the day that weighting begins. Wessex.

## Comparative Fastness of Dyeing Wool and Cotton

I would like to have your opinion as to the comparative fastness of black and other colors on cotton and wool. I have been informed that it is not possible to get a color on cotton as fast to light as on wool. Canton (2189).

The idea that a color on cotton cannot be as fast to light as when dyed on wool would seem to arise from the fact that the cotton fiber has much less affinity for coloring matter than the wool fiber. In cotton dyeing fastness to washing in the majority of cases is at least as important as fastness to light. It seems to be agreed upon that indigo is not

as fast on cotton as on wool, but what red on wool is as fast as Turkey red on cotton?

Knecht, Rawson and Loewenthal, in their "Manual of Dyeing," classify dyes in four degrees of fastness: Fast, fairly fast, moderately fast, and not fast. They instance as fast, three wool dyes only, Indigo (on wool), Anthracene Brown and Tartrazine, but several cotton dyes, Turkey Red, Aniline Black, the Sulphide Blacks and Indanthrene. Cotton, therefore, has the vote from this point of view.

As a matter of fact the sulphide blacks may be looked upon as having extraordinary all round properties of fastness, with, of course, the exception of resistance to chlorine, and are at least as fast to light as a woaded logwood black.

The practical question seems to be whether the wool and cotton in unions can be dyed with colors of a good and equal fastness to light. There does not seem to be much difficulty in this respect, especially with the blacks and navy blues. It is not uncommon to see an old suit in which the woolen or worsted has turned rusty, while the cotton shows little alteration.

If the question was which fiber could be dyed with the most fugitive colors, there is little doubt about it. Some of the direct cot-

ton colors and basics will show a change in a few hours of direct sunlight and vanish in a week or two of exposure. It would be impossible to free wool wholly of its color by exposure to the sun, however dyed.

Culebra.

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## Water Required for a Bleachery and Dye House

How much water is required to operate a bleachery and dye house? Buxton (1162).

It would be difficult to state the exact amount of water required to operate a bleachery, or a bleachery and dye house, on account of the amount of waste for washing down purposes.

The amount would also vary according to the process used and the different methods employed in bleaching piece goods, and bleaching and dyeing yarns or raw stock. For a bleachery producing piece goods, and equipped to handle from 30,000 to 35,000 pounds of piece goods per week, with the following machines: Two large washing machines with two three-inch valves each, two squeezers with two two-inch valves each, one lime machine with one two-inch valve, and four kiers for boiling purposes, the quantity of water required would be from 800 to 1,000 gallons per minute. These figures are based

on the assumption that there will be a steady flow of water passing through the machines during the washing-out process, which is necessary in the production of piece goods, besides supplying the finishing end with water at the same time. It is essential that the water used for finishing the goods should be perfectly clear.

A small dye house working on yarns and raw stock would not require as much water as a bleachery working on piece goods. Most of the washing is done in the closed machine, then run off and the machine filled up again until a thorough wash is obtained, instead of having a steady flow of water passing through the machine as in the process for piece goods.

A small bleaching and dyeing plant for yarns and raw stock equipped to produce from 2,000 to 2,500 pounds per day would require from 2,000 to 2,500 gallons of water per hour on an average day's work. The quantity required would vary according to the methods employed and the process required. A few years ago I was in charge of a plant producing 60,000 to 65,000 pounds of piece goods per week, with three large washers, three squeezers, one lime machine and six kiers. For this plant we had a rotary pump lifting 1,800 gallons of water per minute and we did not have any too much; of course it supplied the finishing end as well as the bleachery.

I would advise having too much water rather than not enough and run the risk of having tender goods through not being thoroughly washed. Delco.

## Sulphur Smell on Goods after Bleaching

Can you inform me what will take the sulphur smell out of knit goods after the goods have been sulphur bleached? Washing seems to darken the goods. Claxton (1991).

I have had a great deal of trouble with sulphur bleached goods and have tried a number of remedies, but found the following to be the best: Wash off with 3 per cent. of sulphuric acid with plenty of cold water. This will brighten the goods and free them from the sulphur smell. Dryden.

## Oxidized Black on Hosiery

What will give an oxidized black on hosiery a good bluish cast and a soft feel? Is there anything in sulphur black that will make the goods tender after they lie in boxes for some time? Lenox (1962).

To produce an oxidized black on hosiery, and to have a blue tone, requires that the dyer should use a grade of aniline oil or aniline salts possessing the property when dyed of giving a black which has such a blue tone. As dyers are not, as a rule, competent to make the exact chemical test to determine the

shade giving value of a sample of either oils or salts before using, it devolves upon them to top off their dyeings with either a blue or blue shade of violet to give the desired shade, but it is needless to remark that this topping only remains until the hosiery is washed for the first time, when it is completely removed.

Fast black dyeing requires more experience than any other branch of the trade, and it is useless to give a formula with the expectation that it will prove a success the first time it is tried. However, the following formula in daily use in a large mill doing high class work should prove of interest.

Prepare a stock solution as follows:

| | | |
|---|---|---|
| Aniline Salt | lbs. | 130 |
| Acetate of Copper | lbs. | 6 |
| Muriate of Ammonia | lbs. | 12 |
| Bluestone | lbs. | 40 |
| Chlorate of Potash | lbs. | 30 |

Dissolve completely, and dilute to 14° Tw.

Put the stockings to be dyed in the tom-tom, cover with the stock dye solution, and pound for 1 hour, then whiz for three-quarters of an hour (running the whizzed liquor back to the stock tank). Give the stockings a run for 3 hours at 80° to 90° F. in the revolving cages, when they should change to a dark green. Keep your eye on the temperature, for it is during the oxidizing

in the cages that any injury will be done. Now remove to the ageing room and spread out over night, allowing free access of air, and in the morning put through a bath with 5 per cent. of bichromate for 30 to 40 minutes. Then wash well, extract and board.

A soft feel is always imparted by giving a light soap treatment with the last rinse. Some "softeners" are only ordinary soft soaps.

Sulphur blacks on cotton will not become tender if the goods, after dyeing, are thoroughly rinsed. To the last wash water add 6 ounces of acetate of soda per 10 gallons. Do not wash afterwards. This treatment will effectively prevent the tendering of cotton hosiery or other material dyed with the sulphur blacks. Beta Napthol.

. . .

In order to obtain the bluish cast to oxidized aniline black, resort is often made to a topping with a minute quantity of methylene blue. This dyestuff is usually applied at the same time with the softener. The softener may consist of one of the proprietary cotton softeners of good grade or may consist of olive oil emulsified with a little soda ash and soap. About 2 per cent. of olive oil on the weight of the goods may be used, with 1 per cent. of soda ash and 1 per cent. of olive oil chip soap. To this bath may be added sufficient methylene blue, well dissolved, to give the desired

bluish cast to the black. The treatment in this bath may be carried out lukewarm.

Regarding the tendering of goods dyed with sulphur black. There has been a great deal of discussion ever since the sulphur blacks have come to be so largely used regarding the cause of the tendering or weakening of cotton fabrics which have been dyed with this color. The most conclusive researches on this point have led to the opinion that the tendering effect is due to the formation of sulphuric acid arising from the oxidation of the free sulphur which is to be found in the majority of sulphur blacks on the market. This sulphuric acid does not seem to originate from the sulphide of soda which is used in the dyeing process.

Sulphur blacks are of more or less unknown composition and they probably consist of a mixture of different substances, among which are free sulphur and bodies which on ageing in the air decompose to yield free sulphur. This sulphur in the presence of air and moisture gradually tends to form small quantities of sulphuric acid and this gradually rots the fiber.

To avoid the tendering action of sulphur black dyed material, many suggestions have been made, both by the manufacturers of dyestuffs and by chemists independently. Treatment with sodium acetate after dyeing has

been suggested. Also a scouring in a weak soap bath. Also a treatment with a weak bath of sodium sulphide has been suggested, the idea in this latter case being to remove the sulphur compounds which appear to be soluble in the sodium sulphide. If the sodium sulphide treatment is resorted to, it should be given about 12 hours after the material has been dyed, that is to say, the material, after dyeing and washing with water, is allowed to stand over night and is then run through a bath containing about 3 per cent. of sodium sulphide using the bath at a lukewarm temperature, then rinsing and drying.

Another process for the prevention of the tendering, which has been suggested of recent years, is the precipitation on the fiber of calcium tannate. This is brought about by giving the dyed goods first a bath of tannic acid or sumach extract, using about 5 per cent. of sumach or 2 per cent. of tannic acid on the weight of the goods and then following this treatment with a bath containing about 5 per cent. of milk of lime. The tannic acid absorbed by the cotton will combine with the lime in the second bath and cause an insoluble precipitate of calcium tannate to be formed in the fiber. This calcium tannate is not removed from the goods by washing, as is the case with sodium acetate, and if there is any free sulphuric acid formed in the goods

subsequently it will immediately combine with the calcium tannate, becoming neutralized thereby and thus the tendering effect is prevented.

The treatment with sodium acetate has really this same idea in view, that is to say, it was to serve the purpose of neutralizing the free sulphuric acid by interaction between the acid and the sodium acetate resulting in the formation of sodium sulphate or Glauber salts and free acetic acid which, being volatile, soon passes away and does no injury to the cotton. As already pointed out, however, the defect in the use of sodium acetate as an after-treatment lies in the fact that this salt is readily soluble in water and while it may serve its purpose when the goods are being stored before sale, nevertheless the first washing such goods receive will, of course, remove all of the sodium acetate and then it is possible that the tendering effect may subsequently become evident. Hertford.

---

## Bleaching Cotton Yarns

Please give me some information on the bleaching of Sea Island, Egyptian and peeler cotton yarns for knit goods. Also the best method of boiling out warp chains for mercerizing, or the treatment that will give the yarn the highest luster. Bleacher (1975).

This is a rather difficult question to answer, as there are so many different ways of obtaining the results desired. The method that is in general use is the caustic boil, chlorine bleach, either chloride of lime or the new liquid produced by the electrolyzer which is gaining popularity every year, with acid as a neutralizer. This is used for the bleaching of the material. The system of handling is another matter. Some prefer to boil in the bundle, in either open kiers or high pressure kiers, the high pressure kiers being preferable for a caustic bleach. Some boil off in the bundle in the kier, and then the goods are transferred to a washing machine where they are bleached and washed and soured with removing.

We will suppose "Bleacher" is to bleach a batch of 2,000 lbs. of yarn in the bundle. To begin with the goods are put in a kier, each layer being evenly pressed down, the joints being broken as much as possible and each layer saturated thoroughly until they are all in the kier. A liquor of caustic soda is made with 2 to 4 per cent. of caustic based on the weight of the goods in the batch and varying with the quality of the yarn, a fine yarn not requiring as much as a coarse yarn. Allowance is also made for the twist. If it is a soft twist it will not require as much as a

hard twist. Enough liquor is made to cover the goods. They are then boiled from 6 to 9 hours as the case may be.

If a good white is desired and the goods are to be finished soft, they should be boiled 6 hours, then washed in the kier, next treated with a fresh liquor of 2 per cent. soda ash and then boiled again for 3 or 4 hours. Then wash off and bleach, using the bleach liquor at 1/2° Tw. at the strongest. Then wash off and neutralize with acid, care being taken not to have either of the baths too strong. After washing the goods off and extracting they are ready for drying. The above process is all right if the goods are carefully watched at boiling. Do not use any soap or softener in the boil, nor have the chemic too strong and then a strong acid will not be necessary to neutralize the bleach.

## Dyeing Mercerized Cotton to Stand Cross-Dyeing

We have been trying to get a pink and blue mercerized cotton that will stand dyeing and come out bright and near the same color. We bought developed colors and have been very careful about dyeing, but the colors change so much that they are no good. We color an acid black in a formic acid bath and we desire a pink and blue that will stand cross dyeing for forty minutes in this bath. The colors that we have tried so far have all come off

during the dyeing process. Will you kindly tell us how to overcome this?

Buxton (1986).

Two considerations are necessary to make a good job of cotton dyeing to stand cross-dyeing with acid colors. First, the cotton dyes must be applied by a process that is capable of producing fast colors; second, the cross-dyeing bath must be made up with dye that will not stain the previously dyed cotton.

For pinks on cotton, try Diamine Rose B D Extra or G D or Direct Rose T dyed in the usual manner as for direct colors. Irisamine G or Rosazeine 6 G are also used for this purpose, dyed on tannin and antimony salt mordant, and after dyeing again passed through the tannin and antimony salt baths. All the above colors resist formic acids in the cross-dye bath.

For blues, try New Methylene Blue G G or N, dyed exactly as for Irisamine above mentioned.

To dye cotton for cross-dyeing, especially when mordanting with tannin, give plenty of time.—say, over night, and fix thoroughly in the antimony salt bath. Time is a very important factor. In selecting the acid black, it is always best to decide after making a few trials on a laboratory scale, and even then proceeding with caution with the first set of pieces in the dye house. Beta-Naphthol.

From this inquiry it appears that "Dyer" desires to obtain a pink and blue color on mercerized cotton which is fast to cross-dyeing, the cross-dye being an acid black employed in a bath containing formic acid.

In this case, for the blue it would be possible to use a number of sulphur blues of the various brands at present on the market; the exact selection, of course, would depend on the particular shade of blue desired. It would also be possible to obtain a cross-dye blue by using some of the basic blue dyes applied on a mordant of tannin and antimony; the exact dyestuff to be employed also in this case would depend on the shade desired. The problem of getting a pink color on mercerized cotton, fast to cross-dyeing, is more difficult, especially if it is desired to have a pink of a very clear and bright tone. The sulphur colors in such a case would not be applicable, as they would not yield a pink of sufficiently bright a hue, and the basic colors which are at command for this purpose are not especially fast to cross-dyeing. However, it would be possible to employ some of the more recent vat colors for this purpose. The indanthrene, thio-indigo colors, and helindone colors would be suitable for this purpose. It might also be said that these vat colors could be used for the production of cross-dyed blue desired.

It must be borne in mind, however, that the acid black which is used for the cross-dyeing of the wool will more or less affect and stain the colors on the mercerized cotton. This effect would probably be very little noticed in the case of the blue color, especially if this color were of a dark blue, but, of course, the slightest stain of the black would make itself very apparent in the pink color. There are various acid blacks, of course, and some of them would naturally have a greater effect in this way than others and it would be a matter of some investigation by the dyer to fix upon a particular acid black which would give him the proper shade on his wool and also the minimum staining effect on the pink dyed cotton. J. M. Matthews.

## Stamping Hosiery

Can you give me any information regarding stamping hosiery so as to get a clear, sharp impression like that on sample enclosed?
Thornton (1261).

Apparently the stamp used is one of the usual ones in which the letters are formed out of strip brass set in a base or handle of wood and the ink appears to be a water-paste compound.

Part of the problem of clear stamping consists in getting an equal distribution of the ink or paste used so that it may be picked up

evenly by the stamp and transferred uniformly to the fabric. Where a water paste is employed it is best to use a cloth pad on which to ink the stamp. With a little care the pad can be uniformly covered. All that can be then done is to apply the stamp with firm and equal pressure while the fabric is laid on a plane and equal surface.

It does not follow, however, that the impression will be as white and solid as could be desired. There are difficulties which letter press printers experience in getting a good white impression upon a dark background and these present themselves in stamping hosiery. The stamp fails to carry a sufficient body of dense, opaque white and a more or less grey, ragged and illegible impression is the result. To obtain a good white mark, a quantity of color has to be laid down on the fabric, and in general watery mixtures are not the best for this purpose. They are perhaps the simplest and cheapest to use and they are most readily removed from the garment, but in the nature of the case they are not the strongest coloring agents.

The practical alternative to a water mixture is an oil mixture and the most useful of these is printer's ink or something of a similar sort. White inks are made for printers' use containing a great body of opaque white pigment expressly for use in printing upon

dark grounds. These, for use in stamping cloth or hosiery, will probably need thinning with printer's varnish or boiled linseed oil. The oil medium in which the color is ground is of considerable tenacity and hence able to carry more pigment than pastes made with water. It cannot be used upon a cloth pad, but may be distributed sparingly upon a rubber one. Either by means of a squeeges roller or an inking ball it can be distributed evenly over the pad so that the stamp gets its proper quota.

The impression, although not indelible, does not so easily rub off as one that is attached simply by gums or glue. It may be advisable to use with such marking inks a deeply engraved metal stamp rather than a built stamp of brass strip. Regent.

The process of stamping by decalcomania transfer has recently been adopted by a number of hosiery manufacturers with much satisfaction. The lettering or design is clean cut and the brilliant gold effect is very attractive.

## Preparing Yarn for Bleaching

What is the proper way to prepare skein yarn for boiling in a kier under pressure, the kier holding 1,200 pounds, and how much caustic soda should be used?

Mitchell (1258).

There are several different methods of preparing skein yarn for bleaching, but the one

generally used is the old way of bleaching yarn, in five-pound bundles. The latest method is what is called the link and chain, which consists in making the skeins in the form of a chain and running them into the kier like a long rope, in the same manner that piece goods are run in the bleaching process. The latter method, however, would require different machinery from that used for the bundle method.

I presume "Mitchell" is not equipped for the chain process, and I will therefore describe the process used for bleaching in the bundle. Pack the bundles, each weighing five pounds, into the kier, and saturate the layer thoroughly with water, then put in the next layer, placing the bundles even, but not too tight, in the kier, laying the second layer across the joints of the first layer, and so on, crossing the joints of each layer until the full weight is in the kier. Saturate each layer with water, leaving the outlet valve open to allow the surplus water to drain off the goods.

When the kier is evenly packed and the yarn saturated, close the outlet valve and mix a solution of 2 to 3 per cent. caustic soda, 2 per cent. of soda ash and 1 to 2 per cent. of soap or bleaching paste. Dissolve in enough water to cover the goods in the kier. If the yarn is coarse, boil the goods for about eight hours at fifteen pounds' pressure; if the yarn

is fine reduce the percentage of caustic soda ash, but give the same length of time in the boil. Or use the same mixture and boil only six hours at fifteen pounds' pressure. It is preferable to use a smaller quantity of caustic and ash and boil for a longer period. "Mitchell" should consider whether the yarn is fine or coarse, hard or soft twisted, as a soft twisted yarn always takes less than a hard twisted one.

I think that "Mitchell" has not been boiling his goods long enough, and that the caustic used is too strong. Uneven packing in the kier will often produce poor results. If a good white is desired I would advise using a mixture of 2 per cent soda ash with the chemic powder or liquor, whichever is used. This mixture brightens the white and softens the yarn. If these instructions are carefully followed the yarns produced will have a fine, soft feel. Dulcimer.

---

## Removing Oil Spots Before Dyeing and Bleaching

I enclose one tan stocking with an oil spot on it, and two bleached stockings showing a black spot and oil spots. The tan hose is dyed with oil, dyestuffs and salt at a starting temperature near to the boiling point. The white hose is boiled out in 6 per cent. solution of

caustic soda under pressure and rinsed thoroughly, then bleached by the lime process.

Clayton (2024).

The oil spots in the sample of hosiery submitted are caused by the use of too much oil in oiling the machine. The black oil spot comes from the bottom of the stud of the dial of the machine. The fact that the oil spots did not come out in the scouring before dyeing or bleaching shows that the oil used is not stainless. The remedy is to use vaseline, not oil, for lubricating the machine. In using vaseline where oil has previously been used, the needle cylinder and dial should first be thoroughly cleaned with benzine. Then after the cylinders are replaced the vaseline is applied with the fingers on the cams in the cam ring. As vaseline is a good lubricant a machine thus greased will last at least a week.

Oil must not be applied to parts where vaseline has been used, otherwise the result will be as bad as if the oil alone had been used. Where vaseline cannot be applied, a stainless oil should be used, so that if by accident it should get on the hosiery it will come out in the scouring previous to dyeing or bleaching. Oil and needle marks can be removed from hosiery before dyeing, provided the oil can be scoured out by a solution of good olive oil soap and sal soda. All goods that have the oily and black spots on them

should be sorted out and scoured in the solution, then put with the regular batch. If vaseline is used on the cams of the machine the difficulty with oil spots will be overcome. The strength of the solution for removing oil spots must be determined by the amount of oil or grease to be removed, making the solution stronger by the addition of sal soda. The temperature of the scouring liquor should not be above 120° F. Water that is too hot has a tendency to set the oil spots in the goods, instead of removing them. Cyrus.

## Determining Proportions of Wool and Cotton in a Fabric

Please give directions for determining the proportions of wool and cotton in a mixed fabric. Also inform us what else we need in connection with your Simplex Yarn Tables to test yarns as to their respective sizes.

Simplex (2136).

The proportions of wool and cotton in a mixed fabric are determined by weighing a sample, boiling it for ten minutes in a 5 per cent. solution of caustic potash or soda, drying, and then weighing the residue, which is cotton. The wool is entirely dissolved by the boiling solution and the cotton is only slightly affected. If extreme accuracy is desired, 5 per cent. should be added to the weight of the cotton residue and the result is the weight

of the cotton in the sample. The difference between this weight and the total weight of the sample before boiling is the weight of the wool. Example: A sample of wool and cotton mixed goods weights 60 grains. After having been boiled for ten minutes in a 5 per cent. caustic solution and dried, the residue weighs 20 grains. Find the proportion of wool and cotton.

20 grains + 5% = 21 grains cotton.

60 — 21 = 39 grains of wool.

21 ÷ 60 = 35% cotton.

39 ÷ 60 = 65% wool.

The Simplex tables indicate the count of any given size of yarn by the various systems of yarn numbering. For example: No. 20s worsted is equal to No. 13 1/3 cotton, No. 37 1/3 linen, 7 run woolen, or No. 22 1/2 metric.

The table also gives the weight of different lengths of each size of yarn, for example:

120 yards of No. 20s worsted weighs 75 grains; 50 yards, 31.2 grains; 25 yards, 15.6 grains; 12 1/2 yards, 7.8 grains; 6 1/4 yards, 3.9 grains. The yards per pound are also given, a pound of No. 20 worsted measuring 11,200 yards. The size of yarn can be determined only by measuring and weighing.

# INDEX


PAGE

Amount of Steam for Heating Water ..... 38
Analysis of Water ..... 28
Black Specks in Bleached Goods ..... 66
Bleached Goods Turning Yellow ..... 60
Bleachery for Ladies' and Children's Underwear 32
Bleachery, Handling Goods in ..... 54
Bleaching Cotton and Silk Mixtures ..... 55
Bleaching Goods Made from Ramie Yarn ..... 41
Bleaching Hosiery, Methods of ..... 52
Bleaching Liquor, Preparing ..... 26
Bleaching Powder, Quantity ..... 13
Bleaching Silk Hosiery ..... 31
Bleaching Yarn ..... 88, 96
Bluish Tint on Bleached Goods ..... 53
Boiling off Silk Knit Goods ..... 37
Brown Spots in Bleaching ..... 63
Calculating Yarn Sizes ..... 100
Cheap Method of Dyeing Cotton Goods ..... 16
Coal Tar for Marks to Stand Bleaching ..... 60
Comparative Fastness of Dyeing Wool and Cotton ..... 79
Cotton Yarn Softener ..... 68
Cross-Dyeing Plated Hosiery ..... 10
Determining Proportions of Wool and Cotton in a Fabric ..... 99
Drying, Temperature for ..... 11, 48
Dyeing Black on Cotton and Wool Hosiery and Knit Goods ..... 15, 23
Dyeing Hosiery ..... 83
Dyeing Mercerized Cotton to Stand Cross Dyeing ..... 90
Electrolysis ..... 26, 54
Extracting Chlorine ..... 14
Fast Dyes on Wool and Cotton Goods ..... 80
Filtering Water ..... 29
Finishing Merino Hosiery ..... 35
Good Fast Black on Knit Goods ..... 20
Half-Silk Bleaching ..... 55
Handling Goods in Bleachery ..... 54
Heating Water, Amount of Steam ..... 38
Hosiery Drying ..... 48
Hosiery Dyeing ..... 57, 83
Hosiery Stamping ..... 93

PAGE
Kier Stains, Removing ..... 9
Loss of Weight in Dyeing and Bleaching ..... 69
Marking Knit Goods to Stand Bleaching ..... 59
Mercerized Goods, Dyeing ..... 24, 90
Merino Hosiery, Finishing ..... 35
Methods of Bleaching Hosiery ..... 52
Non-Shrinkable Process for Knit Goods ..... 48
Oil Spots ..... 66, 98
Oily Odor on Goods ..... 12
Oxidized Black on Hosiery ..... 83
Plated Hosiery, Cross Dyeing ..... 10
Preparing Yarn for Bleaching ..... 96
Purifying Water ..... 31
Quantity of Bleaching Powder Required ..... 13
Quantity of Water Required for Bleaching and Dyeing ..... 81
Radiation of Heat ..... 40
Ramie, Bleaching ..... 41
Recipe for Boiling Compound ..... 28
Removing Kier Stains ..... 9
Removing Oil Spots Before Dyeing and Bleaching ..... 98
Rinsing-off Goods ..... 19, 21
Rushing the Bleaching Process, Result of ..... 62
Scouring and Finishing Wool and Cotton Union Suits ..... 35
Settling Tanks ..... 15
Shrinkage in Dyeing and Bleaching Yarns ..... 69
Silk and Cotton Mixtures, Bleaching of ..... 55
Silk Goods, Boiling off ..... 37
Silk-like Feel on Goods ..... 51
Soap for Knit Goods ..... 12
Softener ..... 17, 37, 68, 85, 98
Solution for Removing Stains ..... 9
Spots on Knit Goods ..... 63, 66
Stamping Hosiery ..... 93
Standing Kettle, Strength of ..... 26
Sulphur Blacks ..... 12, 22, 24, 85
Sulphur Smell on Goods After Bleaching ..... 83
Temperature for Dying ..... 11, 48
Tendering Yarn on Goods ..... 11, 83, 87
Tests for Wool and Cotton ..... 100
Uneven Bleaching ..... 63
Uneven Shades in Dyeing Hosiery ..... 57
Water for Bleaching ..... 28
Water Required for Bleachery and Dye House ..... 81
Weighting Knit Goods in Finishing ..... 77
Yarn Bleaching ..... 88, 96
Yellow Marks in Bleaching and Finishing ..... 32
Yellow Tone on Goods ..... 50, 60

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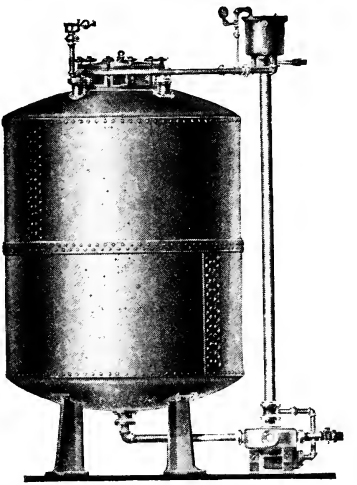

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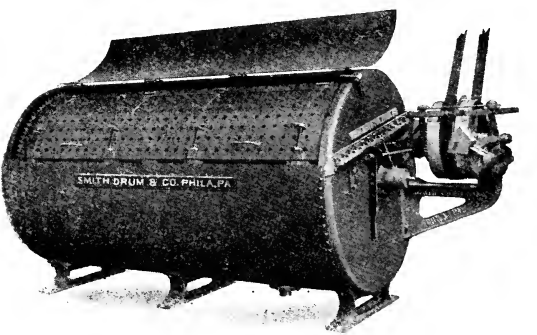


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